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14. ABSTRACT

Methods for identifying individuals at risk for the development of work-related upper extremity disorders (WRUEDs) are essential to initiate prevention and early intervention. The present study developed a self-report measure of workstyle, proposed as a potential risk factor for WRUEDs. Workstyle is the manner in which an individual performs work and has been proposed to describe how psychosocial job demands and ergonomic risks interact and influence the development, maintenance, and/or exacerbation of WRUEDs. Focus groups of office workers identified workplace stressors and individual behaviors that are hypothesized components of the workstyle construct. Responses were used to generate specific set of items that were assumed to reflect the multiple dimensions of workstyle, including patterns of thoughts and behaviors experienced while at work and behaviors, emotions and symptoms experienced during periods of high work demands. These items, along with self-report measures of job stress, ergonomic exposures, upper extremity functional outcomes, and general health, were administered on a web-based questionnaire. A sample of 282 office workers, mostly women (75%) between the ages of 22 to 65 who were employed an average of 42.3 hours per week, was studied. Factor analyses of the potential workstyle items yielded a set of six characteristic work behavior subscales and four high demand response subscales. The subscales demonstrated high internal consistency (alpha= 0.61 to 0.91) and test-retest reliability (r= 0.68 to 0.89) after three weeks. Workstyle scores were normally distributed and higher scores were significantly correlated with higher levels of pain, functional limitation, and adverse mental and physical health. Higher workstyle scores were also associated with the presence of work-related upper-extremity symptoms at 12 months (OR=2.51; 95% CI=1.18 5.38), after controlling for measures of ergonomic risk and job stress. Given the acceptable psychometric properties, the proposed measure should be useful in future epidemiological studies on workstyle and WRUEDs. Additionally, the Workstyle Survey can assist in the identification of individuals at risk for the development of WRUEDs and may be useful in designing intervention programs that are most applicable for the individual worker.

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ABSTRACT

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Rena A. Nicholas, Master of Science, 2002

Thesis directed by: Michael Feuerstein, Ph.D.

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subscales and four high demand response subscales. The subscales demonstrated high internal consistency (alpha= 0.61 to 0.91) and test-retest reliability (r= 0.68 to 0.89) after three weeks. Workstyle scores were normally distributed and higher scores were significantly correlated with higher levels of pain, functional limitation, and adverse mental and physical health. Higher workstyle scores were also associated with the presence of work-related upper-extremity symptoms at 12 months (OR=2.51; 95% CI=1.18 – 5.38), after controlling for measures of ergonomic risk and job stress. Given the acceptable psychometric properties, the proposed measure should be useful in future epidemiological studies on workstyle and WRUEDs. Additionally, the Workstyle Survey can assist in the identification of individuals "at risk" for the development of WRUEDs and may be useful in designing intervention programs that are most applicable for the individual worker.

“Workstyle Measurement: Development and Validation”

by

Rena A. Nicholas

Thesis submitted to the Faculty of the Department of Medical and Clinical Psychology

Graduate Program of the Uniformed Services University of the Health Sciences

in partial fulfillment of the requirements for the degree of

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INTRODUCTION

Work-related musculoskeletal disorders involving the upper extremity, such as carpal tunnel syndrome and tendonitis, are significant sources of injuries reported in the modern workplace. In the United States, these upper extremity disorders are associated with the longest absences from work compared to any other injury (i.e., carpal tunnel syndrome is the injury/illness that accounts for the most time missed) (Bureau of Labor Statistics, 2001) and have resulted in over $20 billion in workers' compensation costs alone in 1999 (National Research Council, 2001). Additionally, these disorders have negative consequences for the individual in terms of physical and mental health, productivity, and function (Himmelstein et al, 1995; NIOSH, 1997). Upper extremity disorders have similar impacts on workers in other countries as well (Frederiksson et al., 1999; Kompier, Aust, van den Berg, & Siegrist, 2000). Due to their universal presence and costs, these disorders have been of particular interest to the occupational health community. However, the specific etiology of work-related upper extremity disorders (WRUEDs) remains unclear.

WRUEDs are disorders of the muscles, tendons, and nerves of the upper limb that can be caused or exacerbated by the physical and psychosocial aspects of the work environment (National Research Council, 2001; Remple, Dahlin, & Lundborg, 1999; Bongers, Kremer, & ter Laak, 2002). They are experienced as pain, numbness, stiffness, and aching in the fingers, wrists, forearms, elbows, upper arms, neck and shoulder regions (Armstrong et al., 1993). Their onset, exacerbation, and maintenance are hypothesized to originate in a complex interaction among ergonomic, psychosocial, and individual factors (Frederiksson et al., 1999; National Research Council, 2001).

Ergonomic risk factors associated with WRUEDs include: repetitive motion, awkward postures, excessive force, and inadequate rest cycles (Armstrong et al., 1993; Frederiksson et al., 1999). Psychosocial risk factors for upper extremity problems include high perceived job stress, high work demands, and non-work related stress (Bongers et al., 2002; Bongers, de Winter, Kompier, & Hildebrandt, 1993). Individual factors can include physiological (i.e., muscle loading capacity, nerve conductance rate) and psychological (i.e., personality characteristics, stress appraisal) characteristics that influence the individual's response to work. Studies that evaluate the combined contributions of the ergonomic, psychosocial, and individual variables account for a greater extent of the variability in upper extremity symptoms than those examining the contributions of only one of these variables alone (Kompier et al., 2000; Christmansson, Friden, & Sollerman, 1999; Hakkanen, Viikari-Juntura, & Takala, 1997), suggesting that these factors may interact in some yet to be determined manner to initiate symptoms. The exact nature of this interaction remains the source of much debate.

Upper Extremity Disorder Models

Several authors have proposed models to explain the potential interaction among physical, psychosocial, and individual risk factors for the development of WRUEDs (Huang, Feuerstein, and Sauter, 2002). For example, Carayon, Smith, and Haims (1999) proposed a balance theory of job design and stress model specific to WRUEDs that is based upon a "feedback loop" of short and long term stress responses on the workplace and the individual's characteristics. The work system results in short-term stress responses, which lead to long-term stress outcomes. According to Carayon and

colleagues, the work organization consists of workplace ergonomic and psychosocial stressors. Individual characteristics, such as stress appraisal, personality, skills, are proposed to affect each of the model components. The long-term outcomes continue the model's cycle by influencing the individual's perception of the work organization (Carayon et al., 1999). While this model is useful for describing how WRUEDs may develop in general, there was no elaboration on *how* the individual characteristics affect the work organization and stress response components. Furthermore, the model does not describe the processes that trigger individual responses and how these impact the work system to contribute to the formation and course of WRUEDs. Nevertheless, the model does acknowledge that these differences do occur, and suggests that the exploration into these individual characteristics is warranted.

Melin and Lundberg (1997) proposed a biopsychosocial model of job stress and musculoskeletal disorders in individuals who perform work that consists of low physical demands such as computer-related occupations. According to the model, mental and physical workplace stressors may produce physiological responses that can contribute to the experience of upper extremity symptoms. These workplace stressors may occur due to overstimulation or understimulation while at work. This model also addresses the contribution of non-work-related stressors and responses by proposing that the non-work-related influences prevent full recovery from stress and physiological arousal, sustaining muscle tension and psychological distress. The chronic physiological excitation over time increases the individual's risk for developing WRUEDs by exposing the upper extremity tissues to continued or episodic physical strain. The biopsychosocial model's consideration of the non-work-related factors and recognition of the stress related to

understimulation at work are two of the strengths of this model. However, this model does not address the specific workplace or individual components that may lead to potentially high-risk physiological responses. This model is complementary to other models designed to highlight the specific effects of workplace and individual variables on WRUEDs.

A third proposed model of WRUEDs is the ecological model of musculoskeletal disorders by Sauter and Swanson (1996). According to this model, biomechanical strains imposed by the workplace and task are compounded by the individual's physiological responses to psychological strain resulting from workplace psychosocial stressors. This model recognizes individual differences in perception, attribution, and other cognitive processes by indicating that these characteristics moderate the experience of symptoms. For example, the individual's characteristics, such as stress appraisal and attribution style, can determine how and when symptoms are detected and the explanation for these symptoms. If the worker attributes their pain and discomfort as originating in the workplace, his or her subsequent illness behaviors, such as help seeking or injury reporting, can be influenced by how s/he views the organizational climate. Additionally, the upper extremity symptoms themselves as well as attributions regarding the workplace as the cause of the pain may increase the perception of stress while working (Sauter & Swanson, 1996).

The ecological model is one of the more comprehensive models of the WRUED formation process. One of the strengths of this model is its consideration of the cognitive components that can differentially affect the development and experience of WRUEDs. This model also addresses the ergonomic and job stress components that can contribute to

WRUEDs. Nevertheless, clarification and explanation of the cognitive and biomechanical components of the individual's response to workplace stressors is required for a more complete understanding of the processes involved in the development of WRUED. This area is one that should be addressed or elaborated upon by this model or future models.

The Workstyle Model

Each model described above makes a contribution to the theoretical understanding of WRUEDs. However, as noted in each description, the individual characteristic components and their influences are not thoroughly defined. There is a need to focus on the individual's interaction with the work environment because investigations into the etiology of WRUEDs indicate that the individual's biological and psychological characteristics and responses to work are associated with upper extremity symptoms (Feuerstein & Fitzgerald, 1992; Lundberg et al., 1999; Feuerstein, Huang, Haufler, & Miller, 2000; National Research Council, 2001). Therefore, models that address such factors may contribute to a more comprehensive understanding of the workplace's role and influences in the course of WRUEDs. One such model that addresses this limitation, proposed by Feuerstein in 1996 and refined by Feuerstein and colleagues in 1999, is the workstyle model.

The workstyle model is based upon the hypothesis that *how* an individual performs his/her work tasks in reaction to increased work demands may increase the likelihood of developing WRUEDs (Feuerstein, 1996). Individuals experience different levels of psychological and physiological arousal while at work. This arousal may

interact with the physical task, workplace environment, job stress, and the individual's characteristics (i.e., perceptual style, training, etc.) to influence the biomechanical behaviors the individual generates, as well as the occurrence of behaviors that contribute to recovery for upper extremities, such as rest and stretch breaks while at work. The cognitive and behavioral components of an individual's workstyle may become particularly detrimental to musculoskeletal health when the individual is under high work demands and/or psychological distress. In such a case, the person may respond by generating behaviors such as repeated, forceful, and rapid motions for a sustained period of time. These are behaviors that are associated with biomechanical risk factors for the development of WRUEDs (Armstrong et al., 1993; Frederiksson et al., 1999, National Research Council, 2001).

The model proposes that these potentially high-risk behaviors may be driven by perceived stress and negative cognitions (i.e., related to fear, anger, or uncertainty), or are self-generated by a need for achievement or approval or out of fear of adverse consequences. Whether environmentally or internally triggered, the repeated elicitation of these behaviors can lead to a cascade of physiological changes that over time can set the stage for increased levels of fatigue, pain and functional limitations that are frequently observed in individuals with various work related upper extremity symptoms/disorders (National Research Council, 2001; Feuerstein, 1996). This psychological, physiological, and behavioral response to high work demands is an individual's workstyle.

According to the workstyle model, workplace psychosocial stressors, work demands, and ergonomic stressors act on the individual to trigger an adverse workstyle. The psychosocial stressors can include factors such as poor social support and low job

control (Warren et al., 2000; Frederiksson et al., 1999; Bongers et al., 1993). Work demands include items such as workload and workload variability (Bongers et al., 2002; Frederiksson et al., 1999; National Research Council, 2001). Ergonomic stressors may be inherent in poor workplace design (e.g., anthropometric design flaws) or may result from the postures and motions necessary to perform the task (e.g., repetitive motions on an assembly line). An adverse workstyle may consist of cognitive, behavioral, and/or physiological components, such as feelings of distress, sustained forceful movements or awkward postures, and heightened levels of muscle tension, respectively. The elicitation of this high-risk workstyle can lead to acute, symptoms of pain, tension, and stiffness. If repeatedly activated, these short-term symptoms and concomitant physiological processes could, over time, lead to chronic upper extremity symptoms, disorders, and even disability. The model also proposes a "feedback" mechanism where the symptoms and disorders exacerbate the demands, psychosocial stressors, and ergonomic risks inherent in the workplace, increasing the likelihood of an adverse workstyle (Feuerstein, 1996; Feuerstein, Huang, & Pransky, 1999). Although the exact biobehavioral processes are unclear at present, research has corroborated this theoretical process leading to WRUEDs.

Supporting Research for the Workstyle Construct

Some recent studies provide indirect support for the workstyle concept given their findings on individual differences in biomechanical and physiological responses during ergonomic assessments and interventions in asymptomatic participants. These studies were not designed to specifically measure workstyle, but the outcomes of these studies

suggest that certain factors consistent with the workstyle construct appear to be associated with increases in biochemical strain and thus can set the stage for the onset or exacerbation of upper extremity symptoms. The first of these studies was conducted by Armstrong and colleagues (1994) to examine the finger forces required to activate the keys of different computer keyboards. Key displacement and key forces were measured for 3 types of keyboards used by experienced, asymptomatic keyboard users. The results of this study indicated that the users produced forces greater than necessary to activate the keys across all the keyboards, and that the forces generated differed according to the type of keyboard being used. Another finding of particular significance was the wide variability in the forces generated across participants who were keying to the identical task. The average key forces ranged from 1.3 N to 2.9 N whereas the amount of force required to activate the keys was less than 1 N (Armstrong, Foulke, Martin, Gerson, & Rempel, 1994). The workstyle construct is a possible explanation for this inter-subject variability in force generated in response to a fixed work task because it recognizes the individual differences in the perception and meaningfulness of the task and the differences in behavior that may correspond to these appraisals.

A study with similar findings was conducted by Parlitz and colleagues (1998) to investigate the dynamic finger forces in novice and expert piano players. The aim of this study was to measure the use of finger force in piano playing, which, if inefficient, may contribute to upper extremity symptoms/disorders in musicians (Fry, 1989). In this experiment, participants were required to perform three finger exercises of increasing difficulty on the piano keyboard. Measurements relating to the amount of force applied to the keys and the duration of forceful contact with the keys were collected. The authors

found that novice players generated more force overall and sustained this force on the keys for longer duration than did the expert players. Additionally, as task difficulty increased, both the expert and novice players exerted more force on the keys for longer period of time (Parlitz, Peschel, & Altenmuller, 1998). The results support the workstyle concept by suggesting that increased work demands, both actual and perceived (as may be the case for the novice players), are associated with behaviors that produce sustained force in excess of that required while working. This increase in behavioral and physiological arousal is characteristic of an adverse workstyle (Feuerstein, 1996).

A third study providing indirect support for the workstyle concept is one conducted by Burgess-Limerick and colleagues (1999) which compared suspected ergonomic risk postures associated with computer mouse and trackball use. The study was designed to determine if using a trackball rather than a mouse resulted in fewer deviations from a neutral wrist posture. Participants in this study were required to perform tracking tasks (e.g., tracking a moving display with the cursor) using each of the pointing devices. Participants were encouraged to perform their tasks both as accurately and quickly as possible and measurements of wrist extension and ulnar deviation were collected. Although the results of the study indicated that the trackball significantly decreased the frequency of wrist postures involving ulnar deviation, the authors were unable to definitively conclude that the trackball was an improvement over the mouse as a pointing device because the trackball significantly increased wrist extension. Interestingly, another reason for this inability to state a definitive conclusion was the amount of individual variability in postures across participants associated with both devices. For some participants, the non-neutral wrist postures were not reduced by the

trackball. In these cases, deviated wrist postures occurred regardless of the pointing device used. For other participants, the trackball decreased the amount of ulnar deviation in their wrist postures, but increased the exposure to extreme wrist extension (greater than 30 degrees) beyond the average level experienced by the participants. Because of the variability in the results, the authors stated that individual differences must be considered before initiating an ergonomic intervention (Burgess-Limerick, Shemmell, Scadden, & Plooy, 1999).

This study by Burgess-Limerick and colleagues (1999) provides indirect support for the workstyle concept by indicating that individuals adopt differing postures in response to work demands. It also identifies the presence of a subset of individuals who have a characteristic propensity to engage in high-risk postures, regardless of ergonomic changes to the workstation. Additionally, since the task in this study emphasized speed and accuracy the work demands and possibly stress factors were increased, which may have increased the likelihood of high-risk postures, regardless of the workstation layout and ergonomic devices used.

This characteristic response to work demands in terms of posture and behavior appears to be a feature of an individual's workstyle. Support for characteristic behavioral responses stems from a study of soft-tissue injuries related to computer keyboard use in severely injured computer users (Pascarelli & Kella, 1993). The investigators identified different characteristic postures and "keyboard techniques" that were assumed by the participants during work conditions using a computer keyboard. Of particular note were those workers who expended great amounts of energy when pressing keys, resulting in a loud, clacking noise. These "clackers" worked rapidly and with an intensity of

demeanor, and although direct comparisons were not made, the authors suggest that these workers may have a higher incidence of epicondylitis when compared to workers with other techniques (Pascarelli & Kella, 1993). The studies conducted by Burgess-Limerick and colleagues (1999) and Pascarelli and Kella (1993) support the hypothesis that individuals may have characteristic approaches to work in terms of posture and behavior that place them at increased risk for WRUEDs.

Controlled studies with symptomatic participants have provided evidence that supports the workstyle model. One study examined the biomechanical factors relating to upper extremity disorders in professional sign language interpreters (Feuerstein & Fitzgerald, 1992). This group of workers had come to the researchers' attention due to the high rate of upper extremity disorders (as high as 60% in 1990) diagnosed in this group. The researchers evaluated the psychosocial and ergonomic risk factors that the workers encountered in a standard work task. The ergonomic stressors in this case were of particular note because there were no physical interfaces; rather, the workers' ergonomic risks involved bodily motions and postures assumed during the course of their work. Symptomatic and asymptomatic participants' upper extremity motions were observed for hand/wrist deviations from a neutral position, reaching beyond an ideal workspace envelope, pace of finger/hand motions, high-impact hand contacts, and smoothness of finger/hand movements, as well as time spent at rest breaks. Self-reported ratings of pain, fatigue, and function were also collected (Feuerstein & Fitzgerald, 1992).

The results of this study indicates that the symptomatic group engaged in potentially high-risk behaviors from a biomechanical perspective and reported more adverse outcomes than the asymptomatic group in response to the same work demands.

Those participants who reported working with pain were more likely to engage in rapid, forceful, "jerky" movements outside an anthropometrically ideal workspace, as compared to those interpreting without pain whose movements were more flowing, smooth, and less likely to extend beyond an optimal work envelope. Additionally, those interpreting with pain spent less time at rest than did those interpreters working without pain (Feuerstein & Fitzgerald, 1992). As is the case with the "clackers" in the Pascarelli & Kella (1993) study, these findings support the workstyle concept by indicating that individuals who engage in potentially high-risk behavior, beyond that required by the actual task, during work are more likely to experience upper extremity symptoms.

Another study that supports the role of workstyle in office-related upper extremity disorders was conducted by Feuerstein and colleagues (1997a) on the differences in keyboard force produced by participants with high levels of upper extremity symptoms compared to those with lower levels of upper extremity symptoms. In this study, participants were required to perform a standard typing task while force applied to the keyboard was measured. Although both groups produced more force than required to activate the keys, as was seen in the similar study by Armstrong and colleagues (1994), the participants with higher reported levels of symptoms produced significantly more keyboard force than did the participants with lower levels of symptoms. Those with higher levels of symptoms also reported significantly more discomfort throughout the task (Feuerstein, Armstrong, Hickey, & Lincoln, 1997a). This study suggests that individuals who generate potentially high-risk work behavior with a biomechanical consequence (i.e., increased force on digits) are more likely to experience upper extremity symptoms. Unfortunately, conclusive statements regarding the causality of

increased force on upper extremity symptoms cannot be made since the study was cross-sectional.

Lundberg and colleagues (1999) also provided indirect support for the workstyle concept and model in their study of psychophysiological stress responses in supermarket cashiers. Participants in this study were employed in cashier tasks involving the repeated motions of dragging items across a barcode scanning device or manually typing the product information into the cash register. During these tasks, measurements of EMG activity in the trapezius region, blood pressure, and heart rate were collected. Participants also provided self-report ratings of musculoskeletal pain tension and stress experienced both at work and at home. For the outcome measures, participants with upper extremity symptoms were compared to those without symptoms. The investigators found that participants with symptoms had significantly higher levels of EMG activity, compared to those without symptoms, throughout the work task, but not during rest periods (Lundberg et al., 1999). The results of this study support the workstyle model by providing evidence that symptomatic individuals produce increased muscle tension in response to work demands when compared to asymptomatic individuals.

Study Rationale

The workstyle construct and model can potentially bridge the gaps related to individual differences in the existing models of general WRUED development. However, the contribution and impact of workstyle on WRUEDs remains unclear, partly due to the absence of specific measurement and testing to examine workstyle's presence and influence in workers. Although workstyle has been operationally defined

(Feuerstein, 1996), the absence of a measure has limited the conclusions that can be made regarding the hypothesized effects of workstyle on the development, exacerbation, and maintenance of WRUEDs. A standardized measurement protocol has not been used across studies to clearly and reliably identify its relationship to upper extremity symptoms. Therefore, a measure is needed to allow researchers to determine the source of suspected high-risk response (i.e., the work process itself or self-generated by the worker's distress) and identify the conditions under which such responses are initiated and maintained.

The development of a valid, reliable self-report measure of workstyle can enable researchers to compare the influence of workstyle across different workplaces and working conditions. A self-report measure of workstyle can be economical in terms of time, expense, and effort for administration to a wide number of workers at various locations. Additionally, the self-report instrument to measure workstyle should capture the cognitions and emotions experienced by the worker in response to work demands as well as permit the worker to report cognitions, behaviors, emotions, and physiological symptoms that occur consistently in the workplace, and not simply at the time of observation (i.e., more stable characteristics).

Although indirect measures of the consequence of a high-risk workstyle, such as force measurement, biomechanical observation, and physiological recordings, are currently available and should continue to be used, other more cost effective measures that utilize self-report should be developed to measure the construct. A valid self-report measure can be used with direct, observable measures, such as physiological and behavioral responses to provide a comprehensive measure of an individual's workstyle.

With such measurement options, prospective studies can be initiated to refine and test the workstyle model. Also, since the measure will identify the characteristic high-risk working conditions, behaviors, and cognitions that the worker experiences, it can also be a starting point for interventions to reduce the negative health outcomes that are theorized to be related to workstyle.

The current study was conducted to address this need for a comprehensive measure of workstyle. This study included the development and testing of the proposed workstyle measure, ensuring that it was developed with a sound scientific basis and be rigorously tested for reliability, validity, and discriminability of the construct of interest (Streiner & Norman, 1995). It was hypothesized that this scientific development process would result in a measure of workstyle that would be valid and reliable so that it can be used in future WRUED prevention efforts.

METHODS

Workstyle Scale Development

The items used to measure the workstyle construct were derived from past research (Haufler, Feuerstein, & Huang, 2000; Feuerstein et al., 2000), and focus groups. The generation of items was based on the conceptual framework of the workstyle model (Feuerstein 1996, Feuerstein et al., 1999). The workstyle concept was refined using the input from the focus group participants and subject matter experts on ergonomics, occupational stress and upper extremity symptoms.

Focus group participants were recruited from advertisements in major metropolitan newspapers (Washington Post and Baltimore Sun), regional newspapers and

an employee newsletter for a large government health-related agency (NIH Record). Inclusion criteria were: employed full-time (> 20 hours/week), working at their current job for at least 1 year, aged 21-50, work on a computer at least 3-4 hours/day and if currently experiencing upper extremity symptoms, symptoms appeared since working at current job. Two hundred sixty (260) individuals responded to the advertisements and completed a telephone screen to determine if they qualified for participation. Of those respondents, 64 individuals met the inclusion criteria. 34 workers (27 females and 7 males) participated in 8 focus group interviews (3-6 per group). Of these, 30 were currently experiencing upper extremity symptoms and 4 were asymptomatic.

The focus group process consisted of questions and discussion regarding the following categories: work demands, sources of job stress, an individual's response (behavior, cognitions, and physical reactivity) to job stress, the presence of symptoms and how they are handled by the worker, the functional and work consequences of upper extremity symptoms, and education regarding the workstyle construct. Discussions during the workstyle education portions of the focus groups included a review of the workstyle concept and the dimensions of workstyle. Focus group participants were queried as to beliefs (cognitions) regarding work and their performance at work, perceived and actual reactions of others and factors that may trigger changes in workstyle. They were also questioned in terms of how they respond to increases in work demands behaviorally, physiologically, and symptomatically. Focus group discussions were tape recorded and later transcribed for review.

All focus group transcripts were reviewed for: 1) patterns of features of a high risk workstyle, 2) factors that might trigger a high risk workstyle, 3) emotional,

behavioral and physiological responses to increased work demands, and 4) commonly reported cognitive and behavioral features of workstyle. These factors were hypothesized to be related to the workstyle construct and model (Feuerstein et al., 1999) and were the basis of subsequent questionnaire items. Focus group participants were also questioned in terms of preferences for various stem formats and response item formats in questionnaires. Lastly, a subset of symptomatic workers from earlier focus groups completed provided input on a draft version. All focus group participants completed an informed consent and were compensated $35 for their time.

Following the worker focus groups, 2 additional focus groups were conducted with health care (occupational physicians, chiropractors, physical therapists, and message therapists) and human factors experts. The purpose of these groups was to expand on the information obtained from the workers and to obtain input from providers who evaluate and treat individuals with WRUEDs.

This process resulted in the identification of a pool of workstyle items that assess thoughts and behaviors experienced while at work assumed to be related to the workstyle construct. All proposed workstyle items were compiled into one survey, which was pilot tested to determine clarity and completeness of content, identify redundant items, and assess question format. Pilot testing consisted of a review by selected occupational health experts and administration to small group of individuals (n=5) who participated in the original focus group interviews. These efforts refined the workstyle survey used for testing in this study, which consisted of 136 test items (71 categorical and 55 dichotomous).

Study Population

Participants for the web-based survey portion of the study were recruited from the Washington DC metropolitan area through local newspapers, posted fliers, and word-of-mouth. These recruitment announcements requested that participants be between the ages of 21 and 67, employed full-time in an office environment, and work with computers at least four hours a day. The advertisements indicated that participants with and without upper extremity symptoms were needed to complete one to three surveys at an online website (www.work-health.net). Upon reaching the survey website, participants completed the initial screening portion of the baseline survey to ensure that all participants met the requirements for age, full-time employment (35 hours or more per week), and a minimum of 4 hours per day of computer work. Those participants who did not meet these criteria were not allowed to access the baseline survey. Also, the screening questionnaire disqualified participants who were currently pregnant or were pregnant within the past year, and those who had not been working in their current job for the past year.

Two hundred eight-two (282) participants completed the initial questionnaire. Two weeks following this first survey, participants were asked, via email, to return to the website and complete the survey for a second time. One hundred forty-three (143) of the original participants agreed to complete this retest survey (51.6%). Participants signed an informed consent form and were compensated $10 for each survey they completed.

Baseline Survey

General Overview

In addition to the workstyle items under examination, the baseline survey included existing scales and demographic items for comparison to and validation of the workstyle items. The baseline survey began with a short participant screening section, which required that the participant met the study's inclusion criteria before accessing the survey. Inclusion criteria consisted of the following characteristics: 1) ages between 21 and 60, 2) not currently pregnant and had not been pregnant in the last year, 3) work on a computer keyboard for a minimum of 4 hours per day, 4) employed full-time (35 hours or more per week), and 5) work full time in the current job for the last year. Following the screening section, the baseline survey was divided into nine major sections. The information gathered in the nine sections of the survey was used to determine the validity and reliability of the workstyle construct items and to identify relationships between workstyle and other constructs such as stress, ergonomic risk, or characteristics of the individual or office workplace.

Sociodemographics

The first section consisted of demographic questions. Participants were queried on date of birth (age), gender, and height and weight. Participants also provided information about their handedness, education level, marital status, number of children living in the household, and the wear of bifocals.

Work History

The second section of the survey collected work history information. Participants provided their job title, time at current job, and which of the following job categories best reflected their job title: 1) Managerial/Administrative, 2) Sales/Sales-related, 3) Services,

4) Production/ construction/maintenance/materials, 5) Professional/ Paraprofessional, 6) Clerical/ Administrative Support, or 7) Agriculture/forestry/fishing.

Participants also reported the number of years they worked on a keyboard for 3-4 hours per day, number of hours they work per day and per week, and whether they were self-employed, supervisors, and the number of people supervised. Participants reported other workplace data relating to amount of time at work before taking a break, length of breaks, whether they take a lunch break and the duration of that break, and if they eat lunch at their desks. Participants were also queried about the number of people (more or less than 50) in their organization.

Symptoms and Pain

The third section gathered information regarding the frequency, intensity, and duration of symptoms at various anatomic sites on the upper extremity. Physical symptoms were recorded as a Composite Symptoms Score generated by using a modified NIOSH symptom survey (NIOSH, 1992; Feuerstein, Carosella, Burrell, Marshall, & DeCaro, 1997b). Participants who reported feeling pain, aching, stiffness, burning, tingling, or numbness in any upper extremity anatomical location (fingers, hands/wrists, arm, elbow, shoulder and neck) in the past 12 months completed three additional questions: 1) "How long does this problem usually last?" 2) "How often have you had this problem in the past year?" and 3) "On average, describe the intensity of the problem." The section also queried participants as to whether they took medications for their symptoms, whether had a non-work related injury to the anatomic location, and if the symptoms developed since working with computers.

Respondents rated their levels of upper extremity pain within the past week using a single-item visual analogue scale of pain (VAS Pain) (Huskisson, 1974; Feuerstein et al., 2000). This scale asked respondents to rate their level of pain on a range from zero to ten, where zero related to no pain and ten related to severe pain.

Lifestyle

The fourth section asked participants to report aspects of their lifestyle relating to exercise, diet, and smoking and drinking habits. Participants reported the frequency of engaging in aerobic, strengthening, and stretching exercises. Participants also described their smoking history and the number and type of alcoholic and caffeinated beverages consumed per week. Respondents indicated whether they felt they had enough sleep per week, whether their diet was healthy, and if they had head and back support while driving. These questions were based on the health behavior questions in the Center for Disease Control Behavioral Risk Factor Surveillance Survey (1999).

Work Stress

The fifth section consisted of measures of perceived exertion, job stress, and the proposed workstyle items. Several measures of job stress were included in the baseline questionnaire to determine if the workstyle construct provides information above and beyond conventional measures of job stress. Since it was hypothesized that the workstyle construct can account for portions of the variance in work-related upper extremity disorders, independently of job stress, several widely used measures of job stress were included in the baseline survey.

A modified version of the Borg CR10 Scale was used to assess the perceived exertion respondents felt they experienced during a typical day of work (Borg, 1990).

The second measure in this section consisted of items relating to job stress used in previous National Institute of Occupational Safety and Health (NIOSH) studies (e.g., Hales et al., 1994). Three subscales of this survey, Workload, Workload Variability, and Workload Exhaustion, were used to determine the levels of work demands.

Following the NIOSH job stress measure, the respondents completed the 136 proposed workstyle items generated during the focus group process. The workstyle items consisted of two types of items: 1) workstyle categorical response items (scored on a 5-point Likert scale) followed by the 2) workstyle dichotomous (checkbox) response items. For the categorical response items, participants were asked to rate the degree to which various items described their behaviors at work or to indicate how often they engaged in certain thoughts at work. The five-point Likert scale (0=almost never, 1=rarely, 2=sometimes, 3=frequently, 4=almost always and a "don't know" option) was offered as the response option to these items. For the dichotomous response items, respondents were also asked to identify (yes/no response option) all of their behaviors, symptoms, and emotions experienced "during periods of high work demands."

Next, participants completed the Job Stress subscale of the Life Stressors and Social Resources Inventory (LSRES) (Moos and Moos, 1994). This scale was modified to omit the physical environment item, which was assumed to capture a physical, rather than cognitive stressor. This scale was used to measure levels of work-related conflicts, environment, and task pacing.

The final survey used to assess job stress was the Job Content Questionnaire (JCQ) (Karasek et al, 1998). Three subscales from this survey, Skill Discretion, Decision Authority, and Psychological Workload, were used to assess individual and

organizational factors. This measure was used because of its widespread use in epidemiological studies of job stress and musculoskeletal disorders (National Research Council, 2001).

Social Desirability

The sixth section consisted of the Marlowe-Crowne measure of social desirability (Marlowe & Crowne, 1960). This section was included for comparison and validation of the workstyle item responses. The Marlowe-Crowne Social Desirability Scale is designed to measure an individual's propensity to "socially desirable" responses. A higher score on the Marlowe-Crowne Social Desirability Scale indicates a higher level of the individual's socially desirable responses (Marlowe & Crowne, 1960).

Function and Health

Section seven gathered information relating to the impact of symptoms in upper limbs on function (disorder specific) and general physical and mental health (generic). The Upper Extremity Function Scale (UEFS) measures the degree of upper extremity functional limitation and was used to determine how respondents believed their symptoms affected their overall physical functioning on daily activities (Feuerstein et al., 1997a; Pransky, Feuerstein, Himmelstein, Katz, & Vickers-Lahti, 1997). The Short Form 12 (SF-12) Health Survey was used for its components measuring a self-reported physical and mental health (Ware, Kosinski, and Keller, 1998).

Ergonomic Exposure

Self-report measures of ergonomic risk were included in the baseline surveys to assess the physical exposures in each respondent's workplace. The Job Requirements and Physical Demands Survey (JRPD) Job Factors Subscale was used to measure

ergonomic exposures experienced in the workplace (Marcotte et al., 1997). The JRPD demonstrated adequate test-retest reliability and validity compared to an independent assessment by an ergonomist (Marcotte et al., 1997). Another study comparing the JRPD to ergonomist assessment found the JRPD had better predictive ability than the observational assessments and also indicated that the JRPD measure was able to differentiate levels of pain, functional limitations, and upper extremity symptom severity (Dane et al., 2002).

Workstation Tasks

Section nine gathered about the tasks performed at various workstations in the workplace. Participants reported the number of years working in their current tasks, when they first used a computer and mouse in any work setting, average hours per week, and the percent of total work time allocated to the following tasks: 1) Desk work, 2) VDU work (work at a computer monitor), 3) Laptop computer work, 4) Meetings/seminars, 5) Discussions with coworkers, 6) Phone calls, and 7) Other (Karlqvist, Hagberg, Koster, Wenemark, & Anell, 1996).

Statistical Analyses

Software

All statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 10.0 (SPSS, Chicago, IL).

Factor Analyses

The workstyle items were examined using two varimax rotated component factor analyses for identification of primary factors based on the correlation of the items within

each factor (Nunnally & Bernstein, 1994). The categorical response items (answers using a four-point Likert scale) were analyzed separately from the dichotomous response items. These factor analyses were conducted to determine the item loadings that indicated different factors of workstyle. Items within each factor were considered to load onto a factor if their item loading score was 0.40 or higher. This salient value was considered acceptable for item correlations with each factor (Nunnally & Bernstein, 1994).

Reliability and Validity

The workstyle measure and its summary scores were examined for reliability in terms of internal consistency and stability over time (test-retest). The construct validity of the workstyle measure was first determined in relation to upper extremity disorder outcomes (pain, symptoms, functional limitations, physical and mental health) and divergent validity was examined using existing measures of workplace psychosocial and ergonomic stress. To evaluate the workstyle measure's ability to differentiate levels in clinical outcome variables, a one-way analysis of variance was conducted to determine whether significant differences existed across respondents grouped according to their total workstyle score.

The ability of the workstyle measure to identify individuals with work related upper extremity symptoms was examined through a multivariable logistic regression that controlled for potential confounders, such as psychosocial stress, ergonomic risk, lifestyle, and sociodemographic variables. Comparisons involved individuals grouped into either a case or control condition. Cases had (1) symptoms in any upper extremity location within the past 12 months, (2) absence of any accident or injury, not related to work, which may cause or contribute to the symptom presentation, and (3) symptoms that

began after commencing in the current job. Comparison (control) group members were those who did not report any symptoms in any of the upper extremity locations.

RESULTS

Subject Characteristics

The study included 282 participants who ranged in age from 22 to 65. The average age was 41 years old (SD=10.9). The vast majority (75.5%) of these participants were females and most participants had educational degrees. Participants worked an average of 42.3 hours per week (SD=9.9) and had been at their current jobs for 6.2 years (SD=6.6). Participants were grouped according to their symptoms status: 1) asymptomatic, 2) those with work-related upper extremity symptoms, and 3) those with upper extremity symptoms not related to work (e.g., due to other injury). The groups did not significantly differ on any sociodemographic variable. Other specific subject characteristics and their distributions by group are presented in Table 1.

Insert Table 1 about here

Workplace Characteristics

Participants reported working an average of 8.5 hours per day (SD=1.0) where 54.2% of that time was spent at a video display unit. Most described their job categories as being professional/paraprofessional or managerial/administrative. Approximately 83% of the participants worked in organizations with more than 50 employees and only about 20% were in supervisory positions. Participants reported that they worked just over two and a half hours (mean=155.9 minutes, SD=77.7) prior to taking a break, which lasted an average of 11.8 minutes (SD=8.4). Most participants (70.6%) reported taking a lunch break, which lasted an average of 35.2 minutes (SD=25.3). However, 29.4% of the

respondents reported that they eat lunch at their desks and 33.3% more reported doing so "sometimes." Other specific workplace characteristics and their distributions by group are given in Table 2.

Insert Table 2 about here

Factor Structure

Examination of the eigenvalues for the factor analysis of the categorical response items resulted in the delination of six factors. The six factors account for 47.8% of the total variance among the items. The items that contributed to the first factor suggested that this subscale measured a "Working Through Pain" dimension. Items in this subscale include statements such as: "I continue to work with pain and discomfort so that the quality of my work won't suffer," "I feel achy when I work at my workstation," and "I can't be bothered with these symptoms in my hands/arms/shoulders/neck, I must get my work done." The Working Through Pain subscale accounted for 26.2% of the variance among the items.

The items comprising the second factor indicate the subscale measures the dimension of "Social Reactivity." This subscale accounts for 7.18% of the total variance and includes items such as: "I am afraid to take time off because I don't want to be seen as a slacker," and "I am afraid of making mistakes."

The third factor measures the dimension of "Limited Workplace Support." This dimension appears to measure certain stressors in the workplace that relate to physical and social support or the lack of support from others (i.e., coworkers and supervisors) and from equipment and work processes. This subscale appears to reflect how well the work environment supports the individual in his/her tasks. This subscale accounts for 4.64% of

the variance and consists of items such as: "My boss/coworkers won't let me forget the mistakes I have made," and "There are always some kind of computer problems that make it hard to do my job."

The fourth factor also appears to capture a dimension of time pressure in the workplace and was labeled, "Deadlines/Pressure." The items in this subscale include: "I have so many competing deadlines, I don't know where to start," and "I feel pressured when I'm working at my workstation." The fifth subscale appears to measure a dimension of "Self-Imposed Workpace/Workload" and consists of items such as: "I push myself and have higher expectations than my supervisor and others that I have to deal with at work," and "Others tell me I should slow down and not work so hard."

The sixth factor labeled "Breaks" captures the behaviors workers engage in at work that are associated with reduced physical and possibly mental overexertion. The items in this factor are: "I take time to pause or stretch during a typical day at work," and "I take breaks when I am involved in a project at my workstation." As would be expected, this factor had a negative factor loading, indicating that individuals who subscribe to the risk behaviors and cognitions described in the previous factors tend to not take breaks and stretch during the day.

Examination of the eigenvalues for the factor analysis of the dichotomous items that were included to assess an individual worker's response to increased work demands delineated 5 factors. The five factors accounted for 30.7% of the total variance among the factors. The first factor appears to capture items related to the workers' "Mood" and accounts for 9.42% of the variance. Items in this subscale include: "Anger," "Grumpy," and "Dread." The next subscale contains items that measure the dimension

"Pain/Tension." This subscale accounts for 3.37% of the variance and includes items such as: "Neck pain," "Shoulder tension," and "Back tension."

The third dichotomous items factor appears to capture an "Autonomic Nervous System Response" to increased workload dimension. Examples of these items include: "Cold feet," "Clammy hands," and "Heartburn or upset stomach." The "Autonomic" subscale accounts for 3.66% of the variance. The next subscale measures the dimension of "Numbness/Tingling" and accounts for 3.35% of the variance. Some of the items in this subscale are: "Hand/finger numbness," "Feel tingling down hands," and "Feel weaker."

The fifth dichotomous items subscale consisted of items that were nearly identical to those in the "Breaks" factor. These items were: "Pause/stretch," and "Get up and move around on some schedule." Due to the redundancy with the Breaks factor, this subscale was excluded from subsequent analyses. The results from the factor analyses are summarized in Table 3.

Insert Table 3 here

Summary Measures

To improve the meaningfulness and ease of use for the workstyle survey, the workstyle factors were aggregated into four summary measures based on question type (categorical vs. dichotomous) and according to the nature of the factors. These summary measures appear to reflect various responses that are predicted by the workstyle model (Feuerstein, et al., 1999). The four summary measures include: Characteristic Response to Work; Distress; Symptom Response; and Total Workstyle.

The Characteristic Response to Work score includes all the 57 categorical items delineated from the factor analysis and is conceptualized as a measure of the relatively stable cognitive/behavioral responses in the workplace. This summary score is comprised of the sum of the scores from the following subscales: Working Though Pain, Social Reactivity, Limited Workplace Support, Deadlines/Pressure, and Self-imposed Workpace/Workload subscales, followed by the subtraction of the score from the Breaks subscale. This summary score was computed to reflect a set of cognitions and behaviors assumed to increase risk for upper extremity symptoms/disorders/disability.

The Distress summary score is the sum of the Mood and Autonomic subscale scores and is believed to reflect biobehavioral distress related to workstyle. This score includes 22 total items that appear to indicate cognitive, emotional, and physiological responses to increased work demands. The Symptom Response summary score reflects the worker's physical symptoms that are present in response to high work demands/high workload. This score is the sum of the 12 items in the Pain/Tension and Numbness/Tingling subscales.

The fourth summary measure was computed to provide an overall index of workstyle: Total Workstyle. This score includes 79 total items and is the summation of the 57 Characteristic Response to Work items and the 22 Distress items. This measure was created to provide a metric of workstyle that does not include physical symptoms (e.g., pain, tension, numbness, tingling) generally associated with work related upper extremity disorders. The physical symptoms scores were excluded so that individuals' workstyle scores would accurately reflect their responses to increased work demands while excluding the bias of existing symptoms. (For example, the total workstyle score

for an individual who does not develop "risky" behaviors and cognitions may still be high if s/he significant existing upper extremity symptoms unless these presenting symptoms are excluded.) The total workstyle score was normally distributed (D_k=0.05; p=0.70).

Reliability

The ten workstyle subscales demonstrated a moderate to high degree of internal consistency with reliability coefficients higher than 0.60 (range of 0.62 to 0.91) (Table 4). The lowest reliability coefficient (r^2 = 0.62) was obtained from subscale 6, "Breaks;" however, it should be noted that this factor consisted of only two items. Test-retest correlations comparing workstyle scores at baseline and three weeks following baseline were computed, with Pearson's correlations ranging from 0.68 to 0.90 (Table 5). The results indicate acceptable test-retest reliability for the workstyle subscales and combined scores.

Insert Tables 4 & 5 about here

Construct Validity

Each of the identified dimensions of workstyle was positively associated with measures of pain severity, composite symptom scores, and functional limitations (Table 6). Associations with measures more specific to upper extremity symptoms (i.e., functional limitation) were higher than with the generic SF-12 measure of health. The tendency to rest and take breaks was inversely related to adverse health outcomes (r's= -0.04 –-0.12). Significant, but modest correlations, were observed for the Total Workstyle score (which excluded participants' existing symptoms) and each measure of clinical outcome (r's= -0.20 – 0.44).

The workstyle subscales and total score were moderately significantly correlated with most of the job stress (r's=0.12-0.66) and ergonomic measures (r's=0.15-0.48) (Table 7). Social desirability was modestly inversely related to many of the workstyle dimensions including Workstyle Score (r's=0.13-0.29).

Insert Tables 6 & 7 about here

Differentiation of Case Status

Since the Total Workstyle scores were normally distributed (Figure 1), the participants were divided into quartile groups based on their Total Workstyle scores for this analysis.

Insert Figure 1 about here

The ANOVA indicated a significant difference across the groups on pain ($F = 74.8$, $df = 3$, $p < 0.01$), composite symptoms ($F = 8.6$, $df = 3$, $p<0.01$), functional limitation ($F = 20.0$, $df = 3$, $p < 0.01$), physical health ($F = 3.3$, $df = 3$, $p<0.05$), and mental health ($F = 24.7$, $df = 3$, $p < 0.01$). Post hoc analyses found that higher scores on the workstyle measure were observed with poorer outcomes on each clinical outcome measures.

Post hoc analyses show that for pain ratings, respondents with scores in Quartile 1 (0-25 percentile) reported significantly less pain than the other three quartiles ($p < 0.05$) and respondents with scores in Quartile 4 (76-100 percentile) reported significantly more pain than the other three quartiles ($p < 0.05$). Respondents in Quartiles 2 (26-50 percentile) and 3 (51-75 percentile) did not significantly differ ($p = 0.20$) from each other. For composite symptoms, respondents in Quartile 1 differed significantly from respondents in Quartile 4 ($p < 0.01$). There were no other significant differences among

the groups. For functional limitation, respondents in Quartile 1 were significantly less impaired than those in the other three groups ($p < 0.01$), and respondents in Quartile 2 reported significantly less impairment than the other three groups ($p < 0.01$). Respondents in Quartiles 3 and 4 did not significantly differ from each other ($p = 0.11$). For physical health, respondents in Quartile 1 reported better health than respondents in Quartile 3 ($p < 0.05$) and Quartile 4 ($p < 0.01$). There were no other significant differences among the groups for physical health. Post hoc analyses of mental health ratings indicated that those with scores in Quartile 1 were significantly higher than the other 3 groups ($p < 0.01$) and those in Quartile 4 were significantly lower than the other three groups ($p < 0.01$). Quartiles 2 and 3 did not significantly differ from each other ($p = 0.07$).

The pattern of results also suggests a dose-response relationship between workstyle scores and outcome measures (Figures 2 and 3). This dose-response pattern indicates that the workstyle scores are able to differentiate across individuals with varying levels of upper extremity pain and functional limitations.

Insert Figures 2 and 3 about here

Predictive Validity

The logistic regression model included all variables from the baseline survey with significance levels of less than or equal to 0.25 when examined in univariable analyses (Hosmer & Lemeshow, 2000). These items were: Sociodemographics (gender; age; education; marital status), Work History (years at job; hours work per day; hours work per week), Lifestyle (physical activity; smoking; alcohol use; sleep; diet) and Workstation Assessment (time at tasks; time on equipment), scores from various job

measures (Borg Exertion; NIOSH Workload, Work Variability, and Exhaustion; LSRES Job Stress; JCQ Skill Discretion, Decision Authority, and Psychological Workload; JRPD), and the Total Workstyle Score.

The univariable examination resulted in the inclusion of the following variables into the final regression model: 1) Workload Variability and 2) Exhaustion scores from the NIOSH Job Stress Survey, 3) The Job Content Questionnaire's decision authority subscore, 4) the LSRES job stress index, 5) Marlowe-Crowne social desirability, 6) JRPD ergonomics exposure, 7) the Borg perceived exertion score, 8) the percent of time the individual reported working at a video display unit while at work, and 9) the Total Workstyle score. Variables were entered in a stepwise manner. Each variable in the model was dichotomized for ease of interpretation based on a median split of the reported values and was entered using the low category as the reference/indicator.

The final multivariable model indicated that JRPD score, time spent at a VDU, and Total Workstyle score were significantly associated with case status ($p<0.05$) (Table 8). JRPD score had an odds ratio of 2.59 (95% CI: 1.25-5.36) when an individual's score is greater than the median, and time at a VDU had an odds ratio of 2.11 (95% CI: 1.07-4.17) for scores above the median. The Total Workstyle score's odds ratio was 2.51 (95% CI: 1.18-5.38) for scores above the median. When variable scores were not dichotomized, similar results were found, although the odds ratios reflected risk per point increase rather than for high vs. low group status (i.e., Total Workstyle score odds ratio per point increase was 1.02; 95% CI: 1.01-1.04). The final logistic regression model correctly classified 72.8% of all subjects ($\underline{\chi}^2 = 31.5$, $\underline{df} = 9$, $\underline{p} < 0.01$). However, the model was better at classifying cases (89.8% correct) than controls (36.9% correct).

Insert Table 8 about here

DISCUSSION

Psychometric Properties

The results of this study indicate that the proposed scale is a valid tool for measuring the workstyle construct in office workers and can be used for investigations of WRUEDs. The factor analyses delineated components that are internally consistent and stable over time. The subscales were correlated with and predictive of adverse health outcomes. Additionally, the workstyle measure is related to measures of job stress and ergonomic risk, but the absences of higher correlations indicated that the workstyle measured a construct that was not fully explained by workplace stress and ergonomic exposures since most correlations were not great in magnitude. The Deadlines/Pressure subscale was highly correlated with many of the job stress measures and the Limited Workplace Support subscale was also highly correlated with the LSRES Job Stress measure; however the correlations between these two workstyle subscales and the job stress measures appear to be higher because the Deadlines/Pressure and Limited Workplace Support subscales appear to capture some of the stressors related to the workplace, in addition to workstyle-related concepts. Conversely, the workstyle subscales that capture an individual's cognitions/behaviors and responses to increased work demands were less correlated with measures of job stress, indicating that the workstyle measure assessed unique dimensions not measured by current measures of job stress and ergonomic risk.

The Total Workstyle score differentiated among clinical outcomes and demonstrated a dose-response pattern that supports the hypothesis that adverse workstyle

may be associated with increasing symptoms of WRUEDs. Additionally, the logistic regression indicated that workstyle was significantly associated with symptomatic case status in combination with perceived job stress and ergonomic exposure. These results indicate that the measure possesses acceptable psychometric properties and supports the theoretical model relating workstyle to WRUEDs (Feuerstein, 1996; Feuerstein et al., 1999).

Factor Structure of the Workstyle Measure and Potential Interventions

Overall, the factor structure resulting from this study captures components related to the behavioral, cognitive, and physiological dimensions of the workstyle construct. These components are useful for understanding the specific factors that are associated with an adverse workstyle and may be useful as targets for interventions designed to reduce workstyle and its contribution to the course of WRUEDs. Individually tailored intervention plans can be designed based on the workstyle subscales that are most relevant (e.g., produce the highest scores) for that individual.

The first two subscales, "Working through Pain" and "Social Reactivity," reflect dimensions proposed in the operational definition of workstyle (Feuerstein, 1996). These subscales contain items that describe behaviors and cognitions that are hypothesized to result in a set of conditions that can contribute the development of WRUEDs. Examples of these items include statements such as, "I work in a way that contributes to pain in order to get my work done," "I am afraid to take time off because I don't want to be seen as a slacker," and "I feel achy when I work at my workstation." The "Working through Pain" subscale can be conceptualized as a measure of behavioral exposure to ergonomic risk factors associated with WRUEDs while the "Social Reactivity" subscale consists of

cognitions that serve to drive this unhealthy behavior out of fear of negative consequences at work.

The "Working through Pain" and "Social Reactivity" subscales account for the majority of variance in the factor structure and are the least correlated with measures of job stress and ergonomic exposure. They may also have the most etiological significance for measuring the workstyle construct. These subscales can be thought of as the "most specific" workstyle subscales because of their independence from job stress and ergonomic risk and because of their close adherence to the original workstyle definition (Feuerstein, 1996). These two dimensions of workstyle are important because they can be potentially associated with physiological mechanisms that result in WRUEDs. These subscales differ from measures of job stress and ergonomic exposures because these are responses generated by and within the worker, increasing the exposure to adverse physical conditions, such as sustained awkward postures and forceful motion. Poor postures and forceful motion, either due to the poor ergonomic design of the work task or generated by the individual in response to work demands, can result in sustained compression and extreme muscle and tendon loads which can damage these structures. For example, the individual may work in a way that results in extreme deviations from neutral postures in the elbow or wrist for prolonged periods of time.

Individuals with high levels of "Social Reactivity" as reflected by the subscale, may be more likely to initiate a physiological stress response where catecholamines are released and muscle tension increased. This may contribute to nerve compression by increasing the intra-carpal tunnel pressure and reducing nutrients to the peripheral nerve. The increased EMG activities can lead to sustained loading and tearing of the tendons

and muscles. These conditions can eventually lead to impaired nerve and upper limb function (Remple et al, 1999; Melin & Lundberg, 1997; Mackinnon and Novak, 1994).

Interventions to eliminate sustained exposure to ergonomic risks may include programs to address workplace and individual sources of strain. One possible intervention is to redesign of the workstation wherever feasible to reduce task-imposed ergonomic stressors (National Research Council, 2001; Melhorn, Wilkinson, & Riggs, 2001; Piligian et al., 2000; Bernacki, Guidera, Schaefer, Lavin, & Tsai 1999; Hakkanen et al., 1997; Hurrell & Murphy, 1996). Another possibility for intervention can include psychoeducation and implementation of healthy behaviors such as rest and stretching, which have been shown to reduce upper extremity symptoms (National Research Council, 2001; Lundberg et al., 1999). Cognitive behavioral intervention can reduce the negative cognitions that the individual worker experiences, such as those seen in the "Social Reactivity" subscale, reduce levels of perceived stress, and may be helpful in encouraging the worker to engage in self-care activities such as breaks and stretching (van der Klink, Blonk, Schene, & van Dijk, 2001; Firth-Cozens, 2000; Murphy, 1996).

In addition to the workstyle-specific aspects captured by this measure, the workstyle scale also appears to measure certain aspects of job stress and work demands through the subscales of "Limited Workplace Support" and "Deadlines/Pressure." Variables similar to the job stress dimensions of the workstyle measure have been associated with the development of WRUEDs (Bongers et al., 2002; National Research Council, 2001). The inclusion of these subscales in a comprehensive measure of workstyle appears warranted because they provide an index of job stress specifically associated with workstyle. These dimensions of workstyle suggest that an intervention to

prevent WRUEDs may target these particular psychosocial stressors and/or the individual's response to them. Stress management interventions should attempt to change aspects of the workplace that are stressful in addition to how the individual responds to stress to best address the risk factors associated with workstyle. Job stress interventions can occur at the organizational level by targeting managerial and administrative processes that create high work demands and time pressure on the individual (Hakkanen et al., 1997; Hurrell & Murphy, 1996). Other organizational interventions may include increasing social support, which tends to reduce stress and associated health risks (Firth-Cozens, 2000; Elo & Leppanen, 1999; Ahlberg-Hulten, Theorell, & Sigala, 1995). Supervisors can be trained to improve psychosocial working conditions in ways such as providing regular feedback, which can reduce levels of job stress (Schaufeli & Peeters, 2000; Dollard and Winefield, 1994). Individuals who score highly on these scales may also reduce their levels of distress at work through interventions in time management skills and coping with external stressors (Firth-Cozens, 2000; Reynolds, 2000; Heron, McKeown, Tomenson, & Teasdale, 1999; Murphy, 1996).

The "Self-imposed Workpace/Workload" subscale is a unique aspect of workstyle that may reflect the need for achievement or approval or certain expectations that achievement-oriented workers may impose upon themselves. This perceptual set could exacerbate the experience of job stress and increase the likelihood of behaviors and cognitions similar to those described in the "Working Through Pain" and "Social Reactivity" subscales. Some evidence for this association has been demonstrated in the workaholism literature. While the term workaholism has several definitions (McMillan,

O'Driscoll, Marsh, & Brady, 2001), a common definition of workaholism is: "a desire to work long and hard (where) work habits always exceed the prescriptions of the job and the expectations of the people with whom they work (Macklowitz, 1980). Another frequent definition is: high work involvement, high drive (an inner pressure to work), and low work enjoyment. The "Self-imposed Workpace/Workload" subscale contains items related to both workaholism definitions such as: "Others tell me I should slow down and not work so hard," "I put a lot of pressure on myself," "I do better work than my coworkers," and "I feel like I have to get my work done today because if I don't, I'll have to face it tomorrow."

The "Self-imposed Workpace/Workload" subscale appears to be related to the workaholism construct, particularly in terms of perfectionism, a set of unrealistic expectations from self and others that has the potential for creating high levels of job stress (Scott, Moore, & Miceli, 1997; Porter, 2001). This perceptual set could be a potential target for intervention in order to eliminate some of the stress that can lead to cognitive and behavioral components of adverse workstyle. Options for making perfectionist behavior more adaptive can include individual psychotherapy, such as cognitive-behavioral therapy (Firth-Cozens, 2000). This treatment option has been shown to reduce some of the negative aspects of perfectionism and assist the person in becoming more adaptive to their environment (Ferguson & Rodway, 1994; Reynolds, 2000).

The "Breaks" subscale can be conceptualized as a measure of health behavior. This subscale may identify a potentially important aspect of intervention for those at-risk workers. It is possible that many of the symptoms and physical impairments that are

related to WRUEDs might be reduced when a worker takes breaks and stretches reducing exposure to poor postures, excessive force and sustained muscle activation (National Research Council, 2001; Piligian et al., 2000; Lundberg et al., 1999). Workplaces can implement break periods in a manner that is most beneficial to the workers in a particular workplace.

The emotional and symptom response subscales in the new workstyle measure provide an index of the range of possible physical and psychological reactions to increased work demands. The factor analysis on this section of the measure has allowed for an elaboration of the model in terms of individual responses that occur with work demands, ergonomic stress, and job stress. Therefore, the model can be more specific regarding the potential range of responses to physically and psychosocially stressful working conditions. The items in these subscales represent acute symptoms that if repeatedly triggered, can increase the likelihood of more serious symptom and functional outcomes.

The pattern of reactions may be useful to guide future intervention and triage. For example, the worker can identify his or her pattern of emotional and physical responses to work and be trained to recognize their onset. The presence of these symptoms can cue the individual to take a break or initiate coping responses. These workers may benefit from certain psychophysiological interventions such as relaxation training and biofeedback, which have been shown to be of some use for managing upper extremity pain and stress symptoms (Nord, Ettare, & Hodge, 2001; Hurrell & Murphy, 1996). Additionally, in those individuals who score highly on these various symptoms subscales

may need to be targeted for more aggressive approaches to reduce organization and individual sources of stress.

Implications for Intervention

The interventions listed above are some of the proposed treatments for WRUEDs. None has been shown to be singularly successful in reducing all aspects of job stress, ergonomic risks, and overall symptoms and their consequences. However, interventions that incorporate several different approaches, targeting the physical workplace, organizational factors, and individual responses appear to be the most promising approach (National Research Council, 2001; Herbert, Gerr, & Dropkin, 2000; Kompier et al., 2000; Murphy, 1996; Elkin & Rosch, 1990). The workstyle measure can be a means for developing such a comprehensive treatment plan that is tailored to the worker's pattern of high work style. The subscales can indicate where the worker may need assistance in making the work situation to be the most supportive. For example, if the person scores highly on "Working through Pain" and "Limited Workplace Support," intervention can focus on ergonomic assessment of the workplace, organizational remediation wherever possible to reduce levels of job stress, and possibly CBT or stress management to address the individual's coping resources.

Study Limitations

Although the proposed workstyle measure appears to be valid and useful, it is important to realize that there are areas of the development that require replication to confirm the generalizability of the measure. The most salient limitation in this study is

the sample used to validate the factor structure. First, this survey is generalizable only to office workers similar to those used in this study (i.e., those that meet the inclusion criteria). To improve the usefulness of this measure, it is desirable to create a version that is applicable to other workers and possibly to other musculoskeletal disorders, such as low back pain.

Secondly, although the sample size is reasonable, it may not be completely representative of the office workplace. The sample was not stratified to reflect characteristics of the workforce in terms of demographics such as age, ethnicity, education level, time on the job, and the proportion of symptomatic vs. asymptomatic workers. Additionally, this sample consists of volunteers who may not reflect the attitudes and experience of all workers, including those who may not have volunteered for this study. To counter these biases, efforts were made to recruit as many workers as possible from the Washington DC area who met the study's screening criteria. Recruitment messages were posted in several area newspapers and flyers were placed at various locations within the surrounding communities. Although the symptomatic workers were over-represented in this study, the symptomatic and asymptomatic groups did not differ on any demographic variable. Also, the large number of symptomatic respondents is beneficial because the study was interested in identifying the characteristics that may lead to upper extremity symptoms. In addition, the distributions of the demographic variables were normal throughout the study sample. While these efforts do not entirely negate the biases inherent in this sample, they appear to have recruited a reasonable representation of office workers, particularly those who may be the focus of WRUED intervention programs.

The sample size itself may be a source of other problems with the factor structure of the measure. Large sample sizes are recommended for factor analyses to ensure that the groupings are not simply the effects of sampling error (Nunnaly & Bernstein, 1994). The proportions of sample size as a function of the number of variables used for the two factor analyses in this study were approximately 4:1 for the categorical response items and 5:1 for the dichotomous response items. These proportions appear to be adequate for the stability of the factor structure. Additionally, Guadagnoli and Velicer (1988) conducted a Monte Carlo procedure to empirically determine the sample size required for a factor analysis and determined that sample size depended on the saturation level and number of variables per component. They suggest that a pattern composed of 10 to 12 variables per component with loadings of 0.40 should generate an accurate solution at sample sizes greater than 150 and that components with fewer than 10 variables should require a sample size of 300 or more (Guadagnoli and Velicer 1988). The factors in the Characteristic Response to Work portion of the workstyle measure appear to meet these criteria, since all but the "Breaks" subscales consist of at least 10 items. Additionally, the "Breaks" subscale items had loadings of 0.67 and 0.73 (in a negative direction). These high loadings suggest that the scale should be stable in spite of only having 2 variables in the component (Guadagnoli and Velicer 1988). The Reactivity to High Work Demands portion of the measure appears to be unstable by this standard since three of the factors contain fewer than ten items. For these subscales, Type II errors (failing to identify an item that should be included in the factor) are likely to more exist (Guadagnoli and Velicer 1988). Furthermore, eight items in the categorical section of the factor structure and one item in the dichotomous section loaded on more than one factor, suggesting that

some items may be unstable. The subscales all evidenced good internal consistency demonstrating that the intercorrelations among subscale items are good. However future studies are needed to replicate the structure using larger and more representative samples.

Another limitation of this study involves the dependence on self-report measures for information about organizational climate, ergonomic exposure, and outcome variables such as functional limitation and physical health. Ideally, these variables would be verified by expert observation or measurement, such as medical examinations, expert consultations/examination, and observational checklists. However, studies have shown that self-report measures are useful and valid, even without objective verification (Dane et al, 2002; Landsbergis & Theorell, 2000; Hurrell, Nelson, & Simmons, 1998, Schierhout & Myers, 1996). Therefore, the results of this study can be used with the understanding that some biases related to self-report measures may exist, but their presence is not likely to invalidate the workstyle measure proposed here.

The limitations of this study point out the need for replication and future testing of the proposed workstyle measure. Replications are the first step for ensuring that the factor structure is reliable. Another way to improve the stability of the factor structure while making the measure more usable is to shorten the questionnaire from its 91 total items, perhaps using only those items with greater factor loadings and eliminating the eight that loaded on more than one factor. A shorter survey may be desirable for use in epidemiological studies or for any other study where the full 91 items is too intensive for the study design or purpose. Additionally, a shorter survey may be developed that is applicable to other populations besides office workers. The workstyle measure should also be used in prospective studies, which at present are very few in number in the

WRUED literature. This use would test the workstyle model and help to identify the contribution of workstyle to the development of WRUEDs. Finally, the workstyle subscales can also be used in the planning of interventions to prevent and treat upper extremity symptoms.

Conclusion

In summary, workstyle is a proposed construct that may explain how ergonomic and psychosocial risk factors, combined with individual responses, may lead to the development and or exacerbation of WRUEDs. However, the contribution of workstyle to upper extremity symptoms has not been demonstrated in prospective studies due to the lack of a valid measurement tool. The workstyle measure proposed here addresses that problem and can enable the research in this area to move forward. The factor structure supports the dimensions of the workstyle model in general and shows potential for identifying conditions of the workplace and the cognitive-behavioral responses of a worker that can place an individual at increased risk for future upper extremity problems. The identification of these conditions, such as cognitive and behavioral responses to job demands, may be useful for understanding the specific risk factors each individual experiences and for developing the appropriate intervention strategies for that individual. These risk factors, if identified early, can be the focus of secondary, and perhaps even primary intervention programs to reduce the prevalence and/or chronicity of WRUEDs, workplace productivity, and improving health outcomes.

TABLES

Table 1. Participant Characteristics

	No symptoms (n= 67)	Work-related symptoms (n= 141)	Non-work-related symptoms (n=74)	Total (n= 282)
Age (in years)				
Mean (SD)	40.4 (11.5)	40.4 (10.5)	42.7 (10.8)	41 (10.9)
Years at Job				
Mean (SD)	5.9 (6.8)	6.3 (6.5)	6.4 (6.8)	6.2 (6.6)
Hours of Work per Week				
Mean (SD)	42.5 (6.8)	42.8 (11.0)	40.0 (9.9)	42.3 (9.9)
	n (%)	**n (%)**	**n (%)**	**n (%)**
Gender				
Females	49 (73.1)	106 (75.2)	58 (78.4)	213 (75.5)
Males	18 (26.9)	35 (24.8)	16 (21.6)	69 (24.5)
Education				
H.S. Grad/GED	3 (4.5)	7 (5.0)	5 (6.8)	15 (5.3)
Some College	15 (22.4)	42 (29.8)	21 (28.4)	78 (27.7)
AA/Bachelor's Degree	21 (31.3)	35 (24.8)	17 (23.0)	73 (25.9)
Some Graduate School	5 (7.5)	19 (13.5)	5 (6.8)	29 (10.3)
Graduate Degree	23 (34.3)	38 (27.0)	26 (35.1)	87 (30.9)
Marital Status				
Married	31 (46.3)	64 (45.4)	25 (33.8)	120 (42.6)
Single	26 (38.8)	37 (26.2)	24 (32.4)	87 (30.9)
Single (Cohabiting)	0 (0.0)	12 (8.5)	11 (14.9)	23 (8.2)
Divorced	6 (9.0)	19 (13.5)	12 (16.2)	37 (13.1)
Separated	2 (3.0)	5 (3.5)	1 (1.4)	8 (2.8)
Widowed	2 (2.0)	4 (2.8)	1 (1.4)	7 (2.5)

Note: No significant differences across groups on any variable.

Table 2. Workplace Characteristics

	No symptoms (n= 67)	Work-related symptoms (n= 141)	Non-work-related symptoms (n=74)	Total (n= 282)
Years at Job Mean (SD)	5.9 (6.8)	6.3 (6.5)	6.4 (6.8)	6.2 (6.6)
Years at Current Tasks Mean (SD)	6.5 (5.6)	7.8 (6.6)	8.1 (8.0)	7.6 (6.6)
Hours of Work per Week Mean (SD)	42.5 (6.8)	42.8 (11.0)	40.0 (9.9)	42.3 (9.9)
Hours of Work per Day Mean (SD)	8.5 (1.1)	8.6 (1.1)	8.5 (0.9)	8.5 (1.0)
Years Working at Computer Mean (SD)	12.1 (5.7)	14.2 (7.3)	13.6 (8.3)	13.5 (7.3)
Years Working at Keyboard Mean (SD)	8.3 (5.9)	9.6 (6.1)	9.1 (7.1)	9.2 (6.3)
Years Working with Mouse Mean (SD)	9.8 (4.2)	10.3 (5.1)	8.8 (4.6)	9.8 (4.8)
Time Before Taking a Break (minutes) Mean (SD)	164.3 (89.1)	154.6 (73.2)	150.9 (75.4)	155.9 (77.7)
Length of Break (minutes) Mean (SD)	12.0 (8.7)	11.8 (9.0)	11.6 (6.9)	11.8 (8.4)
Length of Lunch Break (minutes) Mean (SD)	36.6 (25.1)	36.8 (26.2)	31.0 (23.7)	35.2 (25.3)
Percent time at Task per Day Mean (SD)				
Desk work (non-computer)	16.9 (10.4)	16.0 (13.9)	16.8 (10.8)	16.4 (12.3)
VDU work	47.4 (19.2)*	56.5 (19.0)	55.9 (17.9)	54.2 (19.1)
Laptop work	6.6 (19.2)	3.3 (10.3)	3.4 (13.3)	4.1 (13.8)
Meetings/seminars	10.5 (13.6)	8.1 (6.5)	8.4 (8.6)	8.7 (9.2)
Discussions w/ coworkers	10.3 (6.3)	8.8 (5.5)	8.9 (5.3)	9.2 (5.6)
Phone calls	11.6 (8.6)	11.5 (12.6)	9.1 (8.0)	10.9 (10.7)
Other	13.7 (9.5)	7.2 (10.7)	8.5 (9.8)	9.0 (10.3)
	n (%)	**n (%)**	**n (%)**	**n (%)**
Job Category				
Managerial/Administrative	25 (37.3)	54 (38.3)	19 (25.7)	98 (34.8)
Sales/Sales-related	0 (0.0)	3 (2.1)	0 (0.0)	3 (1.1)
Services	0 (0.0)	2 (1.4)	2 (2.7)	4 (1.4)
Production/construction/ maintenance/materials	0 (0.0)	0 (0.0)	1 (1.4)	1 (0.4)
Professional/ Paraprof.	28 (41.8)	48 (34.0)	37 (50.0)	113 (40.1)
Clerical/Admin Support	13 (19.4)	34 (24.1)	15 (20.3)	62 (22.0)
Agriculture/forestry/fishing	1 (1.5)	0 (0.0)	0 (0.0)	1 (1.4)
Number of Employees in Organization				
< 50	12 (17.9)	25 (17.7)	12 (16.2)	49 (17.4)
> 50	55 (82.1)	116 (82.3)	62 (83.8)	233 (82.6)
Supervisory Position				
Yes	12 (17.9)	28 (19.9)	17 (23.0)	57 (20.2)
No	55 (82.1)	113 (80.1)	57 (77.0)	225 (79.8)
Self-employed				
Yes	0 (0.0)	1 (0.7)	1 (1.4)	2 (0.7)
No	67 (100)	140 (99.3)	73 (98.6)	280 (99.3)
Take a Lunch Break				
Yes	49 (73.1)	99 (70.2)	51 (68.9)	199 (70.6)
No	18 (26.9)	42 (28.8)	23 (31.1)	83 (29.4)
Eat Lunch at Desk				
Yes	16 (23.9)	45 (31.9)	22 (29.7)	83 (29.4)
No	25 (37.3)	54 (38.3)	26 (35.1)	105 (37.2)
Sometimes	26 (38.8)	42 (29.8)	26 (35.1)	94 (33.3)

* $p<0.01$. No other comparisons were statistically significant.

Table 3. Factor Analysis Results (n=282)

	Factor Loading	Initial Eigen-value	Variance (%)
Part 1: Characteristic Response to Work (Cognitions/Behaviors)			
Working Through Pain		18.08	26.20
• I continue to work with pain and discomfort so that the quality of my work won't suffer.	0.808		
• I continue to work in a way that contributes to pain in order to get my work done.	0.783		
• My hands and arms feel tired during the workday.	0.746		
• I continue to work in a way that contributes to pain in an effort to ensure quality.	0.742		
• I feel achy when I work at my workstation.	0.730		
• I don't know what to do about pain so I just keep working.	0.695		
• Since there is really nothing that I can do about my pain in my hands/arms/shoulders/neck, I just have to work through the pain.	0.694		
• I can't be bothered with these symptoms in my hands/arms/shoulders/neck, I must get my work done.	0.674		
• There really isn't much I can do to help myself in terms of eliminating or reducing my symptoms in my hands/arms/shoulders/neck.	0.639		
• My fingers/wrists/hands/arms (any one or combination) make jerky, quick, sudden movements	0.519		
• I take medications to manage pain, muscle tension, or other symptoms in my fingers, wrists, hands, or arms in order to keep working.	0.514		
• If I have to talk to my supervisor about my symptoms it will appear that I cannot handle the work	0.471		
• I don't think I am any different from anyone else in my office; we all have pain somewhere in our hands/arms/shoulders/neck	0.410		
Social Reactivity		4.95	7.18
• I can't take off from work because other people at work will think less of me.	0.792		
• I am afraid to take time off because I don't want to be seen as a slacker.	0.730		
• I can't take off from work because I'd be letting down or burdening my boss.	0.710		
• I can't take off from work because I'd be letting down or burdening my coworkers.	0.704		
• I can't take off from work because I'd be letting myself down.	0.683		
• I can't take off from work because it will negatively affect my evaluations, promotions, and/or job security.	0.651		
• I am afraid of making mistakes.	0.600		
• If I take time off to take care of my health or to exercise, my coworkers/boss with think less of me.	0.527		
• I am my own worst critic.	0.508		
• I can't take off from work because I need to work as much as I can to keep the paychecks coming.	0.486		
• I feel like I can't say no to more work.	0.418		
• I would rather work overtime than ask for a deadline to be extended.	0.410		
Limited Workplace Support		3.20	4.64
• I don't really know where I stand despite all the effort I put into my work.	0.668		
• I never know what is exactly expected so I just keep going.	0.665		
• I put a lot of effort into this job and I am not recognized for it.	0.641		
• My boss/coworkers won't let me forget the mistakes that I have made.	0.627		
• The boss doesn't let you forget it if you don't get your work finished.	0.622		
• If I bring up problem(s) to my supervisor, like a coworker not pulling his/her weight, it won't make any difference anyway, so I just go ahead and do the work myself.	0.615		
• My boss regularly sets unrealistic deadlines.	0.553		
• It is frustrating to work for those who don't have the same sense of quality that I do.	0.509		
• There is always some kind of computer problem that makes it hard to do my job.	0.428		
• Old equipment and/or software make it really difficult to get my job done	0.404		

	Factor Loading	Initial Eigen-value	Variance (%)
Deadlines/Pressure		2.53	3.67
• I have too many deadlines and will never be able to get all my work done.	0.726		
• I have so many competing deadlines, I don't know where to start.	0.658		
• I just keep getting more projects and deadlines.	0.646		
• Even if I organize my work so that I can meet deadlines, things change and then I have to work even harder to get my work done on time.	0.590		
• My schedule at work is very uncontrollable.	0.572		
• I feel pressured when I'm working at my workstation.	0.553		
• I really don't have time to take a break because of everything that must get done.	0.488		
• I feel like I can't take time to go to lunch.	0.446		
• I am physically exhausted at the end of the day	0.445		
• I work into the evening in order to complete a project.	0.438		
Self-imposed Workpace/Workload		2.36	3.42
• I push myself and have higher expectations than my supervisor and others that I have to deal with at work.	0.695		
• I always try to do my best because that's what I owe to myself.	0.590		
• I do better work than my coworkers.	0.569		
• I work hard all day so that I can go home with a clear conscience.	0.508		
• I put a lot of pressure on myself.	0.491		
• My coworkers don't pull their weight and I have to take up the slack.	0.479		
• Others tell me I should slow down and not work so hard.	0.472		
• I feel like I have to get my work done today, because if I don't, I'll have to face it tomorrow.	0.437		
• I can't slow my work pace. It is just not possible.	0.418		
• I have to get through this project. When it is over, I'll go back to my normal work mode.	0.417		
Breaks		1.85	2.68
• I take time to pause or stretch during a typical day at work	-0.727		
• I take breaks when I am involved in a project at my workstation	-0.674		
Part 2: Reactivity to High Work Demands			
Mood		9.42	17.44
• Anger	0.649		
• Out of control	0.618		
• Trouble concentrating/focusing on work	0.577		
• Depleted/worn out	0.574		
• Frustration	0.560		
• Grumpy	0.560		
• Overwhelmed	0.550		
• Short fuse/irritable	0.544		
• Dread	0.540		
• Don't want to come to work	0.532		
• Inertia (have trouble getting going)	0.520		
• Flustered	0.476		
• Loss of energy	0.464		
• Fatigue – whole body	0.422		
Pain/Tension		3.37	6.23
• Neck pain	0.753		
• Neck tension	0.677		
• Neck stiffness	0.649		
• Shoulder tension	0.592		
• Back tension	0.550		
• Back pain	0.547		
• Gasping for breath	0.508		

	Factor Loading	Initial Eigen-value	Variance (%)
Autonomic Response		1.98	3.66
• Cold feet	0.613		
• Clammy hands	0.551		
• Increased or decreased appetite	0.499		
• Cold hands	0.478		
• Heartburn or upset stomach	0.453		
• Nightmares	0.434		
• Blurred vision	0.418		
• Sleep problems after work	0.415		
Numbness/Tingling		1.81	3.35
• Hard to turn head	0.690		
• Feel weaker	0.665		
• Hand/finger numbness	0.635		
• Feel tingling down hands	0.531		
• Forearm tightness	0.465		

Table 4. Internal Consistency of Workstyle Factors (n=282)

Workstyle Factor	Chronbach's Alpha
Working Through Pain	0.9049
Social Reactivity	0.8981
Limited Workplace Support	0.8718
Deadlines/Pressure	0.8754
Self-imposed Workpace/Workload	0.8237
Breaks	0.6184
Mood	0.8445
Pain/Tension	0.8114
Autonomic Response	0.6782
Numbness/Tingling	0.7716

Table 5. Test-Retest Reliability for Workstyle Scales (n=143)

Workstyle Scale	Pearson Correlation
Working Through Pain	0.834*
Social Reactivity	0.815*
Limited Workplace Support	0.800*
Deadlines/Pressure	0.870*
Self-imposed Workpace/Workload	0.799*
Breaks	0.730*
Mood	0.758*
Pain/Tension	0.745*
Autonomic Response	0.684*
Numbness/Tingling	0.773*
Characteristic Response to Work (Cognitions/Behaviors)	0.887*
Distress	0.791*
Symptom Response	0.816*
Total Workstyle Score	0.895*

* $p < 0.01$

Table 6. Workstyle Score Correlations with Clinical Outcome Measures (n=282)

	VAS Pain Severity	*Composite Symptoms Score*	*UEFS Functional Limitation*	*SF-12 PCS Physical Health*	*SF-12 MCS Mental Health*
Working Through Pain	0.647**	0.459**	0.554**	-0.414**	-0.258**
Social Reactivity	0.154**	0.171**	0.258**	-0.071	-0.462**
Limited Workplace Support	0.161**	0.143*	0.231**	-0.035	-0.419**
Deadlines/ Pressure	0.223**	0.209**	0.304**	-0.146*	-0.358**
Self-imposed Workpace/ Workload	0.198**	0.107	0.285**	-0.113	-0.243**
Breaks	-0.114	-0.035	-0.118*	0.001	0.080
Mood	0.263**	0.247**	0.306**	-0.062	-0.495**
Pain/ Tension	0.562**	0.417**	0.404**	-0.262**	-0.191**
Autonomic Response	0.236**	0.185**	0.341**	-0.040	-0.360**
Numbness/ Tingling	0.508**	0.463**	0.486**	-0.254**	-0.136*
Characteristic Response to Work	0.370**	0.290**	0.425**	-0.207**	-0.445**
Distress	0.291**	0.260**	0.363**	-0.063	-0.517**
Symptom Response	0.620**	0.498**	0.500**	-0.297**	-0.195**
Total Workstyle Score	0.376**	0.299**	0.435**	-0.197**	-0.473**

* $p<0.05$
** $p<0.01$

Table 7. Workstyle Score Correlations with Job Stress, Ergonomic Exposure, and Social Desirability Measures (n=282)

	LSRES Job Stress	*NIOSH Quantitative Workload*	*NIOSH Workload Variance*	*NIOSH Exhaustion*	*JCQ Skill Discretion*	*JCQ Decision Authority*	*JCQ Psych Workload*	*BORG Exertion*	*JRPD*	*Marlowe-Crowne Desirability*
Working Through Pain	0.339**	0.193**	0.261**	0.385**	-0.025	-0.253**	0.029	0.294**	0.477**	-0.172**
Social Reactivity	0.484**	0.252**	0.316**	0.343**	0.075	-0.129*	0.172**	0.110	0.313**	-0.324**
Limited Workplace Support	0.657**	0.267**	0.330**	0.374**	0.024	-0.357**	0.148*	0.196**	0.365**	-0.273**
Deadlines/ Pressure	0.625**	0.612**	0.603**	0.623**	0.238**	-0.112	0.117**	0.242**	0.378**	-0.193**
Self-imposed Workpace/ Workload	0.486**	0.391**	0.391**	0.359**	0.273**	-0.075	0.304**	0.187**	0.334**	-0.126*
Breaks	-0.091	-0.116	-0.140*	-0.184*	-0.042	0.018	-0.082	-0.077	-0.078	-0.080
Mood	0.479**	0.243**	0.216**	0.393**	0.037	-0.267**	0.211**	0.039	0.310**	-0.289**
Pain/ Tension	0.209**	0.195**	0.189**	0.303**	0.036	-0.060	0.130*	0.145*	0.350**	-0.064
Autonomic Response	0.259**	0.165*	0.181**	0.314**	0.095	-0.116	0.197**	0.094	0.405**	-0.029
Numbness /Tingling	0.203**	0.121*	0.119*	0.328**	-0.005	-0.155**	0.050	0.249**	0.290**	-0.037
Characteristic Response to Work	0.641**	0.416**	0.469**	0.525**	0.131*	-0.238**	0.200**	0.261**	0.475**	-0.276**
Distress	0.468**	0.250*	0.234**	0.421**	0.063	-0.251**	0.236**	0.065	0.389**	-0.237**
Symptom Response	0.237**	0.190**	0.185**	0.359**	0.023	-0.111	0.113	0.213**	0.375**	-0.061
Total Workstyle Score	0.647**	0.413**	0.460**	0.534**	0.128*	-0.250**	0.213**	0.248**	0.484**	-0.283**

* $p<0.05$
** $p<0.01$

Table 8. Prediction of Work-Related Upper Extremity Symptoms (Case) Based on Median Split of Variables (n=202)

Independent Variable	OR (95% CI)
Job Stress	
NIOSH Job Stress	
Workload Variability	0.91 (0.49-2.26)
Exhaustion	1.35 (0.56-3.22)
Job Content Questionnaire	
Decision Authority	0.42 (0.14-1.26)
LSRES Job Stress	0.73 (0.34-1.58)
Individual Factors	
Marlowe-Crowne Social Desirability	0.95 (0.48-1.89)
Ergonomic Risk Exposure	
JRPD	2.59 (1.25-5.36)*
Perceived Exertion	0.94 (0.41-2.16)
% Time at VDU	2.11 (1.07-4.17)*
Total Workstyle Score	2.51 (1.18-5.38)*

* $p < 0.05$

Note: All odds ratios in table reflect high vs. low scores with low group as the reference.

FIGURES

Figure 1. Distribution of Total Workstyle Scores

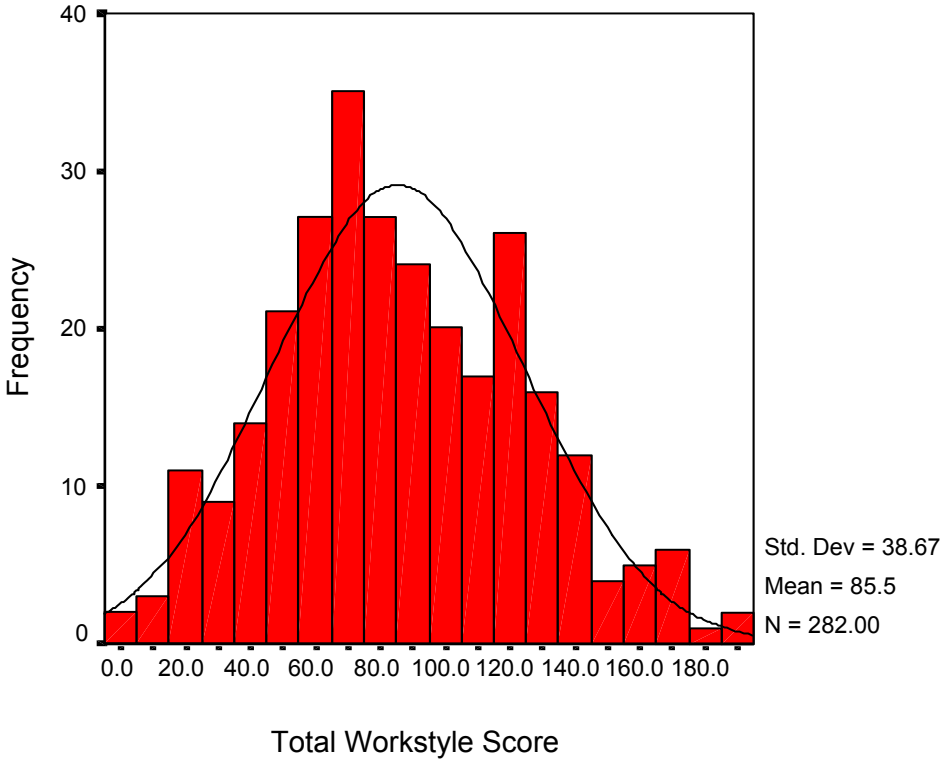


Figure 2. Mean Pain, Symptom, and Functional Limitation Scores by Total Workstyle Score (n=282)

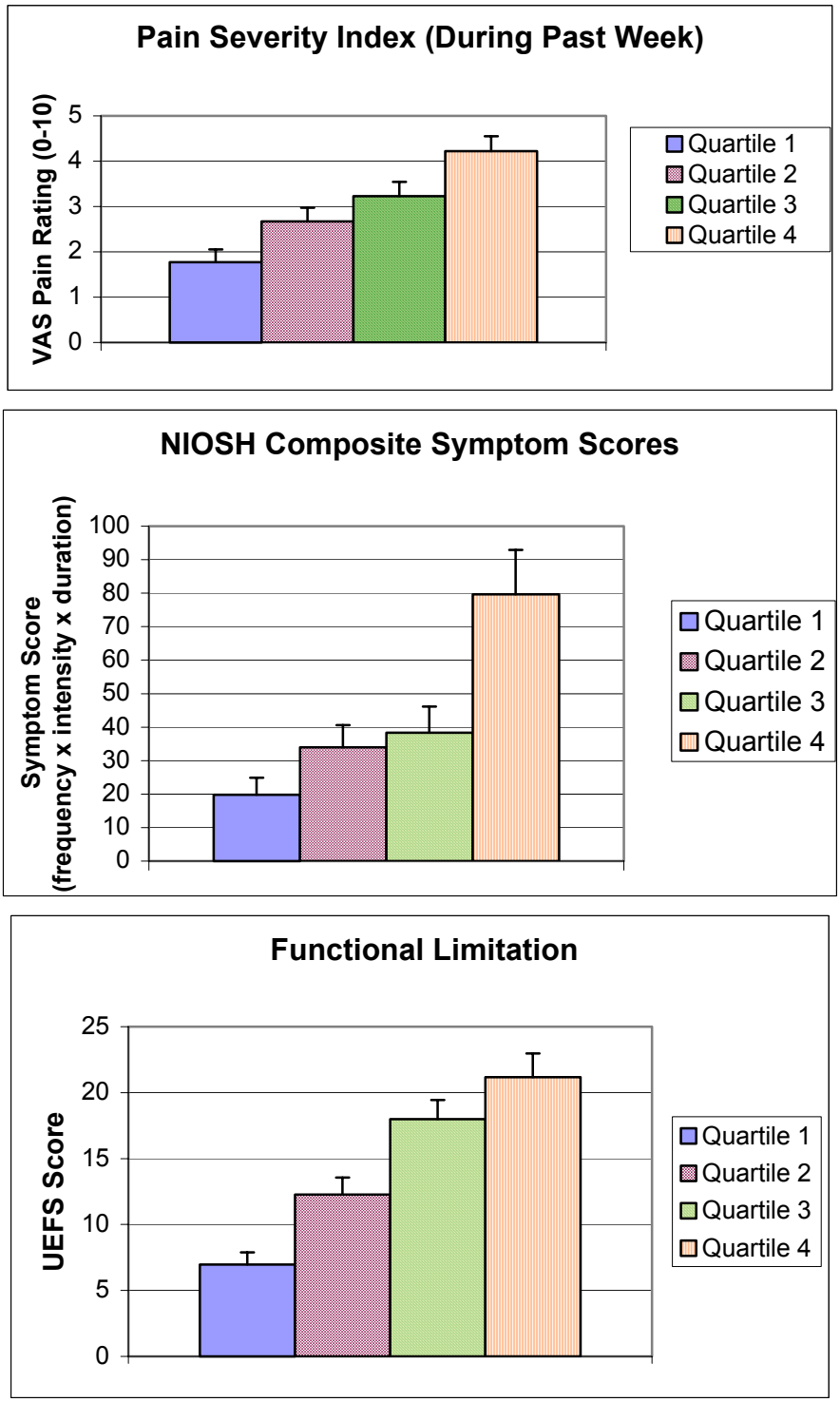
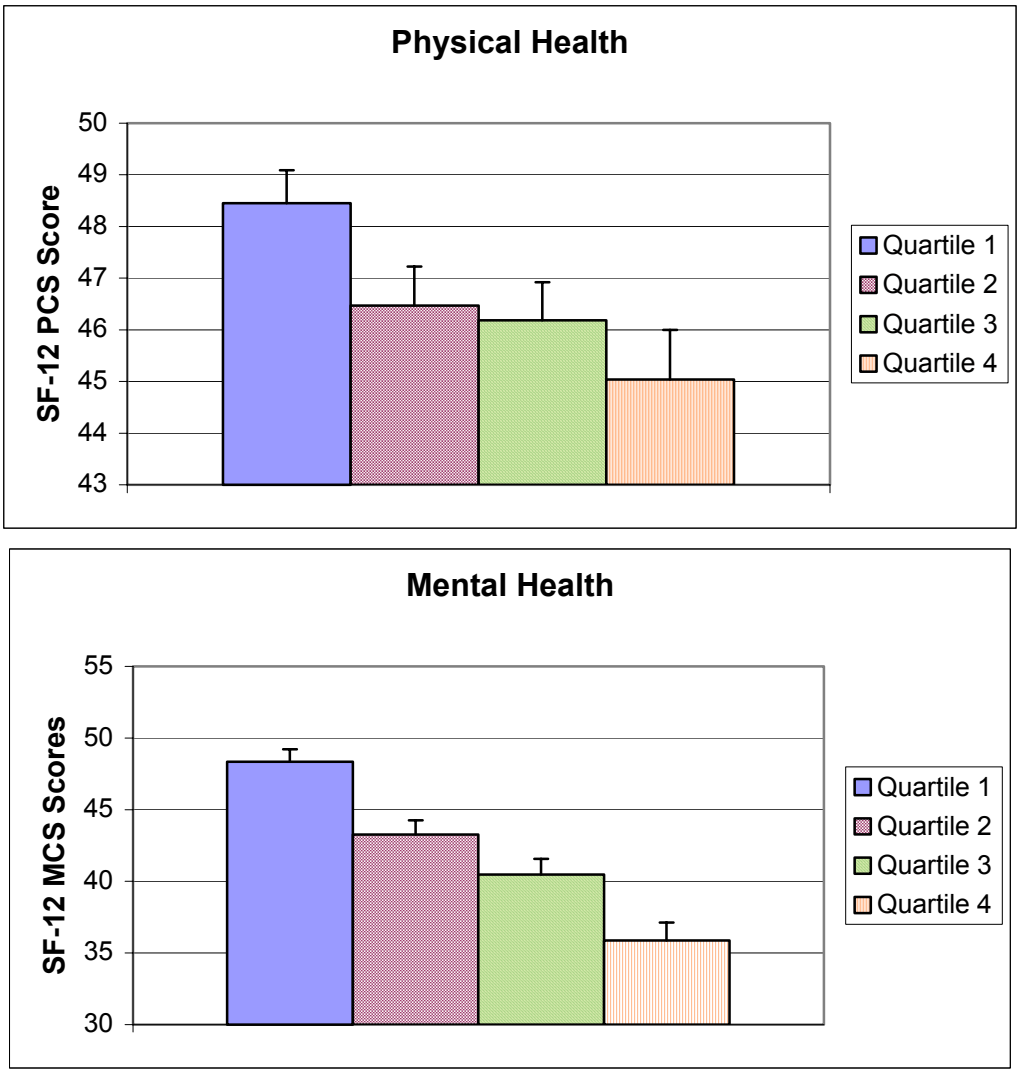


Figure 5. Mean Physical and Mental Health Scores by Total Workstyle Score (n=282)



APPENDICES

APPENDIX I: Baseline Survey

Work-Health.Net

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Work and Health Survey: Demographic Information

Please make certain that you take the time to read and answer each question. Your responses to this survey will help develop an important tool with the potential to improve the health of computer users worldwide. Therefore, it is critical that you anwer this survey honestly and accurately.

1. **Name:** Last: ____ MI: ____ First: ____	
2a. **Email Address:** ____	
2b. **Mailing Address:** Street Address: ____ Apartment: ____ City: ____, State: Select from list Zip Code: ____	
3. **Date of Birth:** Select Month / Day, Year: ____ (ex: 1967)	4. **Gender:** ☐ Female ☐ Male
5. **Home Phone (specify area code):** ____	6. **Work Phone (specify area code):** ____
7. **Height (w/out**	8. **Weight (w/out**

shoes): 0 Feet 0 Inches	**shoes):** Pounds

9. **Dominant hand:** Right Left Both

10. **Education:** Less than High School High School Diploma or GED Some College A. A. or Bachelor's Degree Some graduate school Graduate Degree (M.S., Ph. D., M. D., or terminal degree)

11. **Marital Status:** Single Single but cohabitating Divorced Separated Widowed Married

12. **If you have children,** how many are living at home at this time? NA (# children at home)

13. **Do you wear bifocals** when working on a computer? Yes No

Enter My Information Next Screen =>

Work-Health.Net

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Work and Health Survey: Work History Information

1. **What is your current job title:** _____

2. **How long have you held your current job?** 0 (years) 0 (months)

3. **Please check one of the categories below which most closely reflects your current job title.**
Select from list

4. **Do you currently work on a computer keyboard for at least 3-4 hrs per day?** ☐ Yes ☐ No
If yes, for how many years have you worked on a keyboard for at least 3-4 hrs per day? 0 yrs

5. **Are you currently employed full-time (35 or more hrs/week) or work 2 or more part-time jobs that total at least 35 hrs/week?** ☐ Yes ☐ No

6. **In the past year, on average, how many hrs do you work each day?** _____ hrs/day

7. **Have you been working full time in your current job for at least the past 12 months?** ☐ Yes ☐ No

8. **In the past year, on average, how many hrs do you work each week?** _____ Average no. hrs/wk

9. **Are you in a supervisory role in your job?** ☐ Yes ☐ No
If yes, how many people do you supervise? _____

10. **Are you self-employed?** ☐ Yes ☐ No

11. **How long do you typically work at your computer before taking a break that lasts at least 15 minutes or more?**

Please specify by selecting the number of hours and/or minutes worked before taking a break: (e.g., if you work 1 hour and 30 minutes before taking a break select 1 Hour 30 Minutes)

select Hours select Minutes

12. **When you do take a break, how long is your *typical* break (not including lunch)?**

No. of minutes select

13. **Do you usually take a lunch break?** ☐ Yes ☐ No

If yes, how long (in minutes) is your typical lunch break? No. of minutes 0

If no, do you eat lunch at your desk? ☐ Yes ☐ No ☐ Sometimes (1 or 2 times/week)

14. **How many people are employed by your organization/firm?** ☐ less than 50 ☐ greater than 50

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Work-Health.Net

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Work and Health Survey: Upper Extremity Symptom History

Part 1 of 7

1. Do you currently have or have you had in the past 12 months any symptoms like pain, aching, stiffness, burning, tingling or numbness in your ***finger(s)***?

☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.

a. How long does this ***finger(s)*** problem usually last? ☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months

b. How often have you had this ***finger(s)*** problem in the past year?
☐ Almost never (every six months) ☐ Rarely (every 2-3 months)
☐ Sometimes (once a month) ☐ Frequently (once a week)
☐ Almost always (daily)

c. On average, describe the intensity of pain in your ***finger(s)*** using the scale below (circle the best answer).
☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever

d. Are you currently taking any ***medications*** for symptoms in your finger(s)? ☐ Yes ☐ No

If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250 mg):

	e. Have you ever had an accident or sudden injury to your ***finger(s)***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***finger(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

Next Screen =>

Work-Health.Net

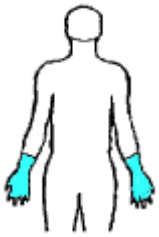
Innovation in research and practice

Work and Health Survey: Upper Extremity Symptom History

Part 2 of 7

2. Do you <u>currently</u> have or have you had in the <u>past 12 months</u> any symptoms like pain, aching, stiffness, *burning, tingling or numbness in your* ***hand(s)/wrist(s)***?

☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.

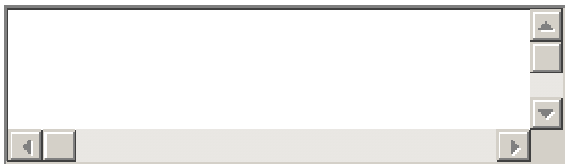


a. How long does this ***hand(s)/wrist(s)*** problem usually last?
☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months

b. How often have you had this ***hand(s)/wrist(s)*** problem in the past year? ☐ Almost never (every six months) ☐ Rarely (every 2-3 months) ☐ Sometimes (once a month) ☐ Frequently (once a week) ☐ Almost always (daily)

c. On average, describe the intensity of pain in your ***hand(s)/wrist(s)*** using the scale below (circle the best answer).
☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever

d. Are you currently taking any ***medications*** for symptoms in your hand(s)/wrist(s)? ☐ Yes ☐ No
If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250

	mg): 
	e. Have you ever had an accident or sudden injury to your ***hand(s)/wrist(s)***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***hand(s)/wrist(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

Next Screen =>

Work-Health.Net

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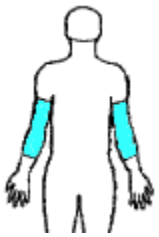
Work and Health Survey: Upper Extremity Symptom History

Part 3 of 7

3. Do you <u>currently</u> have or have you had in the <u>past 12 months</u> any symptoms like pain, aching, stiffness, burning, tingling or numbness in your ***forearm(s)***? ☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.	
	a. How long does this ***forearm(s)*** problem usually last? ☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months
	b. How often have you had this ***forearm(s)*** problem in the past year? ☐ Almost never (every six months) ☐ Rarely (every 2-3 months) ☐ Sometimes (once a month) ☐ Frequently (once a week) ☐ Almost always (daily)
	c. On average, describe the intensity of pain in your ***forearm(s)*** using the scale below (circle the best answer). ☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever
	d. Are you currently taking any medications for symptoms in your ***forearm(s)?*** ☐ Yes ☐ No

	If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250 mg):
	e. Have you ever had an accident or sudden injury to your ***forearm(s)***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***forearm(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

Next Screen =>

Work-Health.Net

Innovation in research and practice

Work and Health Survey: Upper Extremity Symptom History

Part 4 of 7

4. Do you currently have or have you had in the past 12 months any symptoms like pain, aching, stiffness, burning, tingling or numbness in your ***elbow(s)***?

☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.

a. How long does this ***elbow(s)*** problem usually last? ☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months

b. How often have you had this ***elbow(s)*** problem in the past year?
☐ Almost never (every six months) ☐ Rarely (every 2-3 months)
☐ Sometimes (once a month) ☐ Frequently (once a week)
☐ Almost always (daily)

c. On average, describe the intensity of pain in your ***elbow(s)*** using the scale below (circle the best answer).
☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever

d. Are you currently taking any medications for symptoms in your ***elbow(s)?*** ☐ Yes ☐ No

If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250 mg):

	e. Have you ever had an accident or sudden injury to your ***elbow(s)***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***elbow(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

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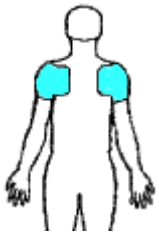
Work and Health Survey: Upper Extremity Symptom History

Part 5 of 7

5. Do you currently have or have you had in the past 12 months any symptoms like pain, aching, stiffness, burning, tingling or numbness in your ***shoulder(s)***?

☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.



a. How long does this ***shoulder(s)*** problem usually last?
☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months

b. How often have you had this ***shoulder(s)*** problem in the past year? ☐ Almost never (every six months) ☐ Rarely (every 2-3 months) ☐ Sometimes (once a month) ☐ Frequently (once a week) ☐ Almost always (daily)

c. On average, describe the intensity of pain in your ***shoulder(s)*** using the scale below (circle the best answer).
☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever

d. Are you currently taking any ***medications*** for symptoms in your shoulder(s)? ☐ Yes ☐ No

	If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250 mg):
	e. Have you ever had an accident or sudden injury to your ***shoulder(s)***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***shoulder(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

Next Screen =>

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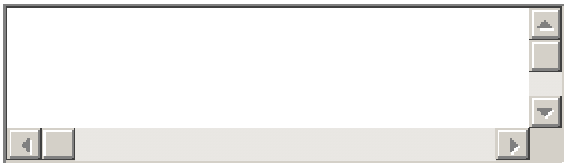
Work and Health Survey: Upper Extremity Symptom History

Part 6 of 7

6. Do you <u>currently</u> have or have you had in the <u>past 12 months</u> any symptoms like pain, aching, stiffness, burning, tingling or numbness in your ***neck***? ☐ **NO, this does not apply to me. (Go to next page)** If yes, please answer questions a - g below.	
	a. How long does this ***neck*** problem usually last? ☐ less than 1 hour ☐ 1 hour to 1 day ☐ more than 1 day to 1 week ☐ more than 1 week to 2 weeks ☐ more than 2 weeks to 4 weeks ☐ more than 1 month to 3 months ☐ more than 3 months
	b. How often have you had this ***neck*** problem in the past year? ☐ Almost never (every six months) ☐ Rarely (every 2-3 months) ☐ Sometimes (once a month) ☐ Frequently (once a week) ☐ Almost always (daily)
	c. On average, describe the intensity of pain in your ***neck*** using the scale below (circle the best answer). ☐ 1 = No pain ☐ 2 = Mild pain ☐ 3 = Moderate pain ☐ 4 = Severe pain ☐ 5 = Worst pain ever
	d. Are you currently taking any ***medications*** for symptoms in your neck? ☐ Yes ☐ No

	If yes, specify each medication, number of pills per day and the dose indicated on bottle (e.g., 250 mg): 
	e. Have you ever had an accident or sudden injury to your ***neck***, such as deep cut, a sports injury, fracture, or tendon tear not related to your work at this worksite? ☐ Yes ☐ No
	f. Did your symptoms develop since you began working with computers? ☐ Yes ☐ No
	g. Have you had this ***neck(s)*** problem during the past 7 days? ☐ Yes ☐ No

Enter my information

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Work and Health Survey: Upper Extremity Symptom History

Part 7 of 7

7. Please rate the severity of any pain in your fingers, hands/wrists, forearms, elbows, shoulders and/or neck during the past week.
Using the scale below where 0 = no pain and 10 = severe pain, please click a circle along the line to indicate your answer.

No pain ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Severe Pain

Enter my information

Next Screen =>

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Work and Health Survey: Lifestyle

1. In an average week, how many times do you engage in physical activity (exercise or work which lasts at least 20 minutes without stopping and which is hard enough to make you breathe heavier and your heart beat faster)?

☐ Less than 1 time /wk ☐ 1 or 2 times /wk ☐ At least 3 times /wk

2. How often do you regularly do strengthening exercises (e.g., with weights or by holding a muscle tight)?

☐ Never ☐ Less than 1 time /wk ☐ 1 or 2 times /wk ☐ At least 3 times /wk

3. How often do you do stretching exercises?

☐ Never ☐ Less than 1 time /wk ☐ 1 or 2 times /wk ☐ At least 3 times /wk

4. How would you describe your cigarette smoking habits?

☐ Never smoked ☐ Used to smoke ☐ Still smoke

5. How many drinks of an alcoholic beverage do you have in a typical week below?

☐ I do not drink alcoholic beverages (go to question 6.)

If you drink alcoholic beverages, write the number of each type of drink you have in a typical week below:

	Bottles or cans of beer		Glasses of wine		Wine Coolers		Mixed drinks or shots of liquor

6. Do you drink caffeinated beverages (tea, soda, coffee)?

☐ Never ☐ 2-3 times/mo ☐ 2-3 times/wk ☐ Daily

7. Do you think that you get enough sleep in a typical week? ☐ Yes ☐ No

8. Do you think you *typically* have a healthy diet? ☐ Yes ☐ No

9. When driving, do you sit so that your back and head are supported by the seat?

☐ Yes ☐ No

Enter My Information Next Screen =>

Work-Health.Net

Innovation in research and practice

Work and Health Survey: Work Stress - Part 1 of 10

1. Rate the degree of physical exertion or effort you believe is associated with a ***typical*** day at work:

☐ 0 Nothing at all	☐ 0.5 Very very easy	☐ 1 Very easy	☐ 2 Easy	☐ 3 Moderately hard	☐ 4 Somewhat hard	☐ 5 Hard	☐ 6	☐ 7 Very hard	☐ 8	☐ 9	☐ 10 Very very hard

2. Using the scale below, please answer the following questions about your **work situation**.
(Select the number that best indicates your work situation.)

	Almost never 0	Rarely 1	Sometimes 2	Frequently 3	Almost always 4
How often does your job require you to work **very fast**?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
How often does your job require you to work **very hard**?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
How often does your job leave you with **little time** to get things done?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
How often is there a **great deal** to get done?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
How often is there a **marked increase** in your workload?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4
How often are there periods at work where you need to increase your focus and concentration to get work completed?	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4

How often is there a marked increase in how **fast you have to think to solve problems at work**?	☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4
How often are you **physically exhausted** at the end of the work day?	☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4
How often are you **mentally exhausted** at the end of the work day?	☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4
How often do you get out of your chair on a **typical** workday?	☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4
How often do you take time from work to relax, stretch, move around, etc during a **typical** work day?	☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4

Enter My Information

Next Screen =>

Work-Health.Net

Innovation in research and practice

Work and Health Survey: Work Stress - Part 3 of 10

Indicate how often you THINK the following thoughts at work						
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I can't take off from work because this place will fall apart without me.	☐	☐	☐	☐	☐	☐
I can't take off from work because I'd be letting down or burdening my co-workers.	☐	☐	☐	☐	☐	☐
I can't take off from work because I'd be letting down or burdening my boss.	☐	☐	☐	☐	☐	☐
I can't take off from work because I'd be letting myself down.	☐	☐	☐	☐	☐	☐
I can't take off from work because I	☐	☐	☐	☐	☐	☐

need to work as much as I can to keep the paychecks coming.						
I can't take off from work because it will negatively affect my evaluations, promotions, and/or job security.	☐	☐	☐	☐	☐	☐
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I can't take off from work because other people at work will think less of me.	☐	☐	☐	☐	☐	☐
I really don't have time to take a break because of everything that must get done.	☐	☐	☐	☐	☐	☐
I am my own worst critic.	☐	☐	☐	☐	☐	☐
I put a lot of effort into this job and I am not recognized for it.	☐	☐	☐	☐	☐	☐

Enter My Information

Next Screen =>

Work-Health.Net

Innovation in research and practice

Work and Health Survey: Work Stress - Part 4 of 10

Indicate how often you THINK the following thoughts at work (continued)

	Almost Never	Rarely	Sometimes	Frequently	Almost Always	Don't Know
I don't really know where I stand despite all the effort I put into my work.	☐	☐	☐	☐	☐	☐
I never know what is exactly expected so I just keep going.	☐	☐	☐	☐	☐	☐
I feel like I can't take time to go to lunch.	☐	☐	☐	☐	☐	☐
It is frustrating to work for those who do not have the same sense of quality that I do.	☐	☐	☐	☐	☐	☐
Others at work tell me that I should slowdown and not work so hard.	☐	☐	☐	☐	☐	☐
I can't be bothered with these symptoms in my hands/arms/shoulders/neck, I must get my work done.	☐	☐	☐	☐	☐	☐
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I can't slow my work pace. It's just not possible.	☐	☐	☐	☐	☐	☐

I don't know what to do about pain so I just keep working.	☐	☐	☐	☐	☐	☐
If I have to talk to my supervisor about my symptoms it will appear that I can not handle the work.	☐	☐	☐	☐	☐	☐
I feel like I can't say no to more work.	☐	☐	☐	☐	☐	☐

Enter My Information

Next Screen =>

Work-Health.Net

Innovation in research and practice

Work and Health Survey: Work Stress - Part 6 of 10

You are half-way through this section and half-way through the survey.

Indicate how often you THINK the following thoughts at work (continued)						
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I do better work than my coworkers.	☐	☐	☐	☐	☐	☐
There really isn't much I can do to help myself in terms of eliminating or reducing my symptoms in my hands/arms/shoulders/neck.	☐	☐	☐	☐	☐	☐
I have to work in the way that I do so that I can get my work done and be able to go home on time.	☐	☐	☐	☐	☐	☐
Since there is really nothing that I can do about my pain in my hands/arms/shoulders/neck, I just have to work through the pain.	☐	☐	☐	☐	☐	☐
My coworkers don't pull their weight and I have to take up the slack.	☐	☐	☐	☐	☐	☐

There are always some kind of computer problems that make it harder to do my job.	☐	☐	☐	☐	☐	☐
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
When I have computer problems, I have to go ahead and try to fix it myself so that I can get my work done.	☐	☐	☐	☐	☐	☐
Old equipment and/or software make it really difficult to get my job done.	☐	☐	☐	☐	☐	☐
I just keep getting more projects and deadlines.	☐	☐	☐	☐	☐	☐
Even if I organize my work so that I can meet deadlines, things change and then I have to work even harder to get my work done on time.	☐	☐	☐	☐	☐	☐

Enter My Information

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Innovation in research and practice

Work and Health Survey: Work Stress - Part 7 of 10

Indicate how often you THINK the following thoughts at work (continued)						
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I have too many deadlines and will never be able to get all my work done.	☐	☐	☐	☐	☐	☐
My boss regularly sets unrealistic deadlines.	☐	☐	☐	☐	☐	☐
I have so many competing deadlines, I don't know where to start.	☐	☐	☐	☐	☐	☐
I don't ask for help meeting deadlines because I don't want it to appear like I can't handle the work.	☐	☐	☐	☐	☐	☐
If everyone took off work because of their aches and pains, there wouldn't be anyone in the office.	☐	☐	☐	☐	☐	☐
	Almost Never	**Rarely**	**Sometimes**	**Frequently**	**Almost Always**	**Don't Know**
I don't think I am any different from anyone else in my office, we all have pain somewhere - hand/arms/shoulders/neck.	☐	☐	☐	☐	☐	☐
I feel like I have to get my	☐	☐	☐	☐	☐	☐

work done today, because if I don't, I'll have to face it tomorrow.						
I always try to do my best because that's what I owe to myself.						

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Work and Health Survey: Work Stress - Part 8 of 10

Check all behaviors/emotions that you experience only during periods of high work demands/work load.	
Hunch over my computer	☐
Hit the keys harder	☐
Squeeze the mouse harder	☐
Never have time to adjust my workstation	☐
Slouch in my chair	☐
Get up and stretch	☐
Stretch and move around when in pain	☐
Stretch and move around on some schedule	☐
Anger	☐
Frustration	☐
Dread	☐
Overwhelmed	☐
Out of control	☐
Have trouble making decisions	☐
Inertia (have trouble getting going)	☐
Depleted/worn out	☐
Don't want to come to work	☐

Flustered	☐
Grumpy	☐
Short fuse/irritable	☐
Increased tension at home	☐
Trouble concentrating/focusing on work	☐
Check all symptoms that you experience only during periods of high work demands/work load.	
Sleep problems after work.	☐
Increased or decreased appetite	☐
Fatigue - whole body	☐
Fatigue - eyes	☐
Blurred vision	☐
Loss of energy	☐
Nightmares	☐
Work related dreams	☐
Heartburn or Upset stomach	☐
Headaches	☐
Neck stiffness	☐
Neck pain	☐
Neck tension	☐
Back pain	☐
Back tension	☐
Shoulder tension	☐
Hand/finger numbness	☐
Elbow pain	☐

Forearm tightness	☐
Cold hands	☐
Cold feet	☐
Clammy hands	☐
Jaw clenching	☐
Flair up of existing medical problems	☐
More susceptible to cold/flues/viruses or cold sores	☐
Flush hot feeling	☐
Gasping for breath	☐
Find it hard to turn head from side to side	☐
Loss of strength in my hands/arms	☐
Feel weaker	☐
Feel tingling down hands	☐
Hurts to hold objects	☐
Hives	☐

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Work and Health Survey: Work Stress - Part 9 of 10

Instructions: These questions are about your current job. The questions are intended to apply to all work environments. However, some words may not be quite suitable for your work environment. For example, the term supervisor is meant to refer to the boss, manager, department head, or the person or persons to whom an employee reports. For each question, please indicate how often these things happen. If the question is NOT APPLICABLE due to the nature of your work situation, please check NA.

	Never 0	***Seldom*** 1	***Sometimes*** 2	***Fairly Often*** 3	***Often*** 4	***NA*** 5
1. Does your supervisor criticize you over minor things?	☐	☐	☐	☐	☐	☐
2. Do you have conflicts with your coworkers?	☐	☐	☐	☐	☐	☐
3. Do you have conflicts with your supervisor?	☐	☐	☐	☐	☐	☐
4. Is there constant pressure to keep working?	☐	☐	☐	☐	☐	☐
5. Does there seem to be a rush or urgency about everything?	☐	☐	☐	☐	☐	☐
6. Are there unpleasant physical	☐	☐	☐	☐	☐	☐

conditions on your job, such as too much noise, dust, etc.?							

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Work and Health Survey: Work Stress - Part 10 of 10

INSTRUCTIONS: Please answer each question by selecting the one answer that best fits your job situation. Sometimes none of the answers fit exactly. Select the option with the answer that comes closest.

1. My job requires that I learn new things.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
2. My job involves a lot of repetitive work.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
3. My job requires me to be creative.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
4. My job allows me to make a lot of decisions on my own.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
5. My job requires a high level of skill.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
6. On my job, I have very little freedom to decide how I do my work.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
7. I get to do a variety of different things on my job.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
8. I have a lot of say about what happens on my job.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
9. I have an opportunity to develop my own special abilities.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
10. My job requires	☐ Strongly	☐ Disagree	☐ Agree	☐ Strongly

working very fast.	Disagree			Agree
11. My job requires working very hard.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
12. I am not asked to do an excessive amount of work.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
13. I have enough time to get the job done.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
14. I am free from conflicting demands that others make.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
15. My job requires long periods of intense concentration on the task.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
16. My tasks are often interrupted before they can be completed, requiring attention at a later time.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
17. My job is very hectic.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree
18. Waiting on work from other people or departments often slows me down on my job.	☐ Strongly Disagree	☐ Disagree	☐ Agree	☐ Strongly Agree

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Work and Health Survey: Marlowe-Crowne

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true of false as it pertains to you personally.			
1.	It is sometimes hard for me to go on with my work if I am not encouraged.	☐ True	☐ False
2.	I sometimes feel resentful when I don't get my way.	☐ True	☐ False
3.	No matter whom I'm talking to, I'm always a good listener.	☐ True	☐ False
4.	There have been occasions when I took advantage of someone.	☐ True	☐ False
5.	I'm always willing to admit it when I make a mistake.	☐ True	☐ False
6.	I sometimes try to get even rather than forgive and forget.	☐ True	☐ False
7.	I am always courteous, even to people who are disagreeable.	☐ True	☐ False
8.	I have never been irked when people expressed ideas very different from my own.	☐ True	☐ False
9.	There have been times when I was quite jealous of the good fortune of others.	☐ True	☐ False

10.	I am sometimes irritated by people who ask favors of me.	☐ True	☐ False
11.	I have never deliberately said something that hurt someone's feelings.	☐ True	☐ False
12.	There have been times when I felt like rebelling against people in authority even though I knew they were right.	☐ True	☐ False
13.	On a few occasions, I have given up doing something because I thought too little of my ability.	☐ True	☐ False

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Innovation in research and practice

Work and Health Survey: Function and Health

Instructions: Please indicate which of the following activities or functions you have difficulty doing because of your symptoms. Select the circle that indicates how much difficulty you have with each activity.

☐ **Check here if you do not have symptoms then go onto the next section.**

		NO PROBLEM									MAJOR PROBLEM (Can't do it at all)
A.	Sleeping	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
B.	Writing	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
C.	Opening jars	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
D.	Picking up small objects with fingers	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
E.	Driving a car more than 30 minutes	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
F.	Opening a door	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○
G.	Carrying milk jug from the refrigerator	1○	2○	3○	4○	5○	6○	7○	8○	9○	10○

H.	Washing dishes	1	2	3	4	5	6	7	8	9	10

Enter My Information

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Innovation in research and practice

Work and Health Survey: Function and Health

Instructions for Completing the Questionnaire

Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by indicating the option that best represents your response.

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor		
☐	☐	☐	☐	☐		

2. The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a) **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐	☐	☐
b) Climbing **several** flights of stairs	☐	☐	☐

3. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time	Most of	Some of the time	A little of the	None of the

			the time		**time**	**time**
	a) **Accomplished less** than you would like	☐	☐	☐	☐	☐
	b) Were limited in the **kind** of work or other activities	☐	☐	☐	☐	☐

4. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	All of the time	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
a) **Accomplished less** than you would like	☐	☐	☐	☐	☐
b) Did work or other activities **less carefully than usual**	☐	☐	☐	☐	☐

5. During the **past 4 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework)?

	Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**		
	☐	☐	☐	☐	☐		

6. These questions are about how you feel and how things have been with you during the **past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the **past 4 weeks**…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) have you felt calm and peaceful?	☐	☐	☐	☐	☐
b) did you have a lot of energy?	☐	☐	☐	☐	☐
c) have you felt downhearted and depressed?	☐	☐	☐	☐	☐

7.	During the **past 4 weeks**, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?						
	All of the time	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**		
	☐	☐	☐	☐	☐		

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Innovation in research and practice

Work and Health Survey: Ergonomics

Thinking about your many job tasks, indicate on average the **number of hours (daily or weekly)** that you experience **each** of the tasks, movements or positions listed below:

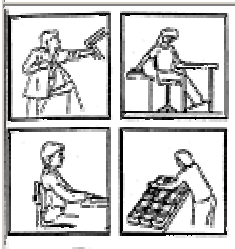
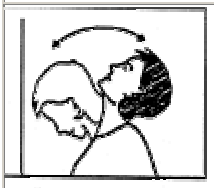
	TASK	More than 4 hrs/day	2-4 hrs/day	Less than 2 hrs/day	Less than 5 hrs/week	Never
 *Figure B.*	**spection carts, etc). (Figure B)**		☐	☐	☐	☐
 *Figure C.*	**2. My neck is tipped forward or backward when I work. (Figure C)**	☐	☐	☐	☐	☐
 *Figure D.*	**3. I cradle a phone or other device between my neck and shoulder. (Figure D)**	☐	☐	☐	☐	☐

 *Figure E.*	**4. My wrists are bent (up, down, to the thumb, or little finger side) while I work. (Figure E)**	☐	☐	☐	☐	☐
	TASK	**More than 4 hrs/day**	**2-4 hrs/day**	**Less than 2 hrs/day**	**Less than 5 hrs/week**	**Never**
	5. I apply pressure or hold an item/material/tool (e.g., screwdriver, spray gun, mouse, etc. in my hand for longer than 10 seconds at a time).	☐	☐	☐	☐	☐
	6. I perform a series of repetitive tasks/movements during the normal course of my work (e.g. using keyborad, tightening fasteners, cutting meat, etc.)	☐	☐	☐	☐	☐
	7. My hands and fingers are cold when I work.	☐	☐	☐	☐	☐
	8. My work requires me to twist my forearms, such as turning a screwdriver.	☐	☐	☐	☐	☐
	9. I wear gloves that are bulky, or reduce my ability to grip.	☐	☐	☐	☐	☐
	10. I squeeze or pinch work objects with a force similar to that which is required to open a	☐	☐	☐	☐	☐

	lid on a new jar.					
	TASK	More than 4 hrs/day	2-4 hrs/day	Less than 2 hrs/day	Less than 5 hrs/week	Never
	objects or tools as tightly onto a pencil.	☐	☐	☐	☐	☐
	12. The personal protective equipment or clothing that I wear limits or restricts my movement.	☐	☐	☐	☐	☐
	on my computer screen or work surface.	☐	☐	☐	☐	☐
	14. I must look at the monitor screen constantly so that I do not miss important information.	☐	☐	☐	☐	☐
	see what I am working with (monitor, paper, parts, etc).	☐	☐	☐	☐	☐

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Work-Health.Net

Innovation in research and practice

Work and Health Survey: Work Station Assessment - Part 1 of 4

1. How long have you worked performing your present tasks? ☐ years

2. When did you first use a computer in any work setting? Select Month month ☐ year (yy)

3. When did you first use a mouse in any work setting? Select Month month ☐ year (yy)

4. Average work hours per week: ☐

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Innovation in research and practice

Work and Health Survey: Work Station ASsessment - Part 2 of 5

Note: The numeric values below must add to 100%

5. Indicate the percentage of total worktime that you allocate to each of the following work tasks:

a. Desk work (not with a computer)	☐ %
b. VDU work (work at a computer monitor)	☐ %
c. Laptop work (work on a laptop computer)	☐ %
d. Meetings/seminars	☐ %
e. Discussions with co-workers	☐ %
f. Phone calls	☐ %
g. Other (please specify) ☐	☐ %
h. Other (please specify) ☐	☐ %
	100%

Enter My Information

APPENDIX II

Workstyle Survey

Please complete the following survey by checking the boxes that describe your experience at work.

Part 1:

Rate the degree to which each of the following items describes you at WORK by selecting the appropriate option

	Almost Never	Rarely	Sometimes	Frequently	Almost Always
1. I continue to work with pain and discomfort so that the quality of my work won't suffer.	[ ]	[ ]	[ ]	[ ]	[ ]
2. I continue to work in a way that contributes to pain in order to get my work done.	[ ]	[ ]	[ ]	[ ]	[ ]
3. My hands and arms feel tired during the workday.	[ ]	[ ]	[ ]	[ ]	[ ]
4. I continue to work in a way that contributes to pain in an effort to ensure quality.	[ ]	[ ]	[ ]	[ ]	[ ]
5. I feel achy when I work at my workstation.	[ ]	[ ]	[ ]	[ ]	[ ]
6. I don't know what to do about pain so I just keep working.	[ ]	[ ]	[ ]	[ ]	[ ]
7. Since there is really nothing that I can do about my pain in my hands/arms/shoulders/neck, I just have to work through the pain.	[ ]	[ ]	[ ]	[ ]	[ ]
8. I can't be bothered with these symptoms in my hands/arms/shoulders/neck, I must get my work done.	[ ]	[ ]	[ ]	[ ]	[ ]
9. There really isn't much I can do to help myself in terms of eliminating or reducing my symptoms in my hands/arms/shoulders/neck.	[ ]	[ ]	[ ]	[ ]	[ ]
10. My fingers/wrists/hands/arms (any one or combination) make jerky, quick, sudden movements	[ ]	[ ]	[ ]	[ ]	[ ]
11. I take medications to manage pain, muscle tension, or other symptoms in my fingers, wrists, hands, or arms in order to keep working.	[ ]	[ ]	[ ]	[ ]	[ ]
12. If I have to talk to my supervisor about my symptoms, it will appear that I can not handle the work.	[ ]	[ ]	[ ]	[ ]	[ ]
13. I don't think I am any different from anyone else in my office; we all have pain somewhere in our hands/arms/shoulders/neck.	[ ]	[ ]	[ ]	[ ]	[ ]

Indicate how often you THINK the following thoughts at work.

	Almost Never	Rarely	Sometimes	Frequently	Almost Always
14. I can't take off from work because other people at work will think less of me.	[ ]	[ ]	[ ]	[ ]	[ ]
15. I am afraid to take time off because I don't want to be seen as a slacker.	[ ]	[ ]	[ ]	[ ]	[ ]
16. I can't take off from work because I'd be letting down or burdening my boss.	[ ]	[ ]	[ ]	[ ]	[ ]
17. I can't take off from work because I'd be letting down or burdening my coworkers.	[ ]	[ ]	[ ]	[ ]	[ ]
18. I can't take off from work because I'd be letting myself down.	[ ]	[ ]	[ ]	[ ]	[ ]
19. I can't take off from work because it will negatively affect my evaluations, promotions, and/or job security.	[ ]	[ ]	[ ]	[ ]	[ ]
20. I am afraid of making mistakes.	[ ]	[ ]	[ ]	[ ]	[ ]
21. If I take time off to take care of my health or to exercise, my coworkers/boss with think less of me.	[ ]	[ ]	[ ]	[ ]	[ ]
22. I am my own worst critic.	[ ]	[ ]	[ ]	[ ]	[ ]
23. I can't take off from work because I need to work as much as I can to keep the paychecks coming.	[ ]	[ ]	[ ]	[ ]	[ ]
24. I feel like I can't say no to more work.	[ ]	[ ]	[ ]	[ ]	[ ]
25. I would rather work overtime than ask for a deadline to be extended.	[ ]	[ ]	[ ]	[ ]	[ ]

Indicate how often you THINK the following thoughts at work.

	Almost Never	Rarely	Sometimes	Frequently	Almost Always
26. I don't really know where I stand despite all the effort I put into my work.	[ ]	[ ]	[ ]	[ ]	[ ]
27. I never know what is exactly expected so I just keep going.	[ ]	[ ]	[ ]	[ ]	[ ]
28. I put a lot of effort into this job and I am not recognized for it.	[ ]	[ ]	[ ]	[ ]	[ ]
29. My boss/coworkers won't let me forget the mistakes that I have made.	[ ]	[ ]	[ ]	[ ]	[ ]
30. The boss doesn't let you forget it if you don't get your work finished.	[ ]	[ ]	[ ]	[ ]	[ ]
31. If I bring up problem(s) to my supervisor, like a coworker not pulling his/her weight, it won't make any difference anyway, so I just go ahead and do the work myself.	[ ]	[ ]	[ ]	[ ]	[ ]
32. My boss regularly sets unrealistic deadlines.	[ ]	[ ]	[ ]	[ ]	[ ]
33. It is frustrating to work for those who don't have the same sense of quality that I do.	[ ]	[ ]	[ ]	[ ]	[ ]
34. There is always some kind of computer problem that makes it hard to do my job.	[ ]	[ ]	[ ]	[ ]	[ ]
35. Old equipment and/or software make it really difficult to get my job done.	[ ]	[ ]	[ ]	[ ]	[ ]

Indicate how often you THINK the following thoughts at work.

	Almost Never	Rarely	Sometimes	Frequently	Almost Always
36. I have too many deadlines and will never be able to get all my work done.	[ ]	[ ]	[ ]	[ ]	[ ]
37. I have so many competing deadlines, I don't know where to start.	[ ]	[ ]	[ ]	[ ]	[ ]
38. I just keep getting more projects and deadlines.	[ ]	[ ]	[ ]	[ ]	[ ]
39. Even if I organize my work so that I can meet deadlines, things change and then I have to work even harder to get my work done on time.	[ ]	[ ]	[ ]	[ ]	[ ]
40. My schedule at work is very uncontrollable.	[ ]	[ ]	[ ]	[ ]	[ ]
41. I feel pressured when I'm working at my workstation.	[ ]	[ ]	[ ]	[ ]	[ ]
42. I really don't have time to take a break because of everything that must get done.	[ ]	[ ]	[ ]	[ ]	[ ]
43. I feel like I can't take time to go to lunch.	[ ]	[ ]	[ ]	[ ]	[ ]
44. I am physically exhausted at the end of the day	[ ]	[ ]	[ ]	[ ]	[ ]
45. I work into the evening in order to complete a project.	[ ]	[ ]	[ ]	[ ]	[ ]
46. I push myself and have higher expectations than my supervisor and others that I have to deal with at work.	[ ]	[ ]	[ ]	[ ]	[ ]
47. I always try to do my best because that's what I owe to myself.	[ ]	[ ]	[ ]	[ ]	[ ]
48. I do better work than my coworkers.	[ ]	[ ]	[ ]	[ ]	[ ]

Indicate how often you THINK the following thoughts at work.

	Almost Never	Rarely	Sometimes	Frequently	Almost Always
49. I work hard all day so that I can go home with a clear conscience.	[ ]	[ ]	[ ]	[ ]	[ ]
50. I put a lot of pressure on myself.	[ ]	[ ]	[ ]	[ ]	[ ]
51. My coworkers don't pull their weight and I have to take up the slack.	[ ]	[ ]	[ ]	[ ]	[ ]
52. Others tell me I should slow down and not work so hard.	[ ]	[ ]	[ ]	[ ]	[ ]
53. I feel like I have to get my work done today, because if I don't, I'll have to face it tomorrow.	[ ]	[ ]	[ ]	[ ]	[ ]
54. I can't slow my work pace. It is just not possible.	[ ]	[ ]	[ ]	[ ]	[ ]
55. I have to get through this project. When it is over, I'll go back to my normal work mode.	[ ]	[ ]	[ ]	[ ]	[ ]

Rate the degree to which each of the following items describes you at WORK by selecting the appropriate option

56. I take time to pause or stretch during a typical day at work.	[ ]	[ ]	[ ]	[ ]	[ ]
57. I take breaks when I am involved in a project at my workstation.	[ ]	[ ]	[ ]	[ ]	[ ]

Part 2:

Check all the behaviors/emotions/symptoms that you experience only during periods of high work demands/work load.

58. Anger	[ ]
59. Out of Control	[ ]
60. Have Trouble Concentrating/Focusing on Work	[ ]
61. Depleted/Worn Out	[ ]
62. Frustration	[ ]
63. Grumpy	[ ]
64. Overwhelmed	[ ]
65. Short Fuse/Irritable	[ ]
66. Dread	[ ]
67. Don't Want to Come to Work	[ ]
68. Inertia (have trouble getting going)	[ ]
69. Flustered	[ ]
70. Loss of Energy	[ ]
71. Fatigue – whole body	[ ]
72. Neck pain	[ ]
73. Neck tension	[ ]
74. Neck stiffness	[ ]
75. Shoulder tension	[ ]
76. Back tension	[ ]
77. Back pain	[ ]
78. Gasping for breath	[ ]
79. Cold feet	[ ]
80. Clammy hands	[ ]
81. Increased or decreased appetite	[ ]
82. Cold hands	[ ]

Check all the behaviors/emotions/symptoms that you experience only during periods of high work demands/work load.

83. Heartburn or upset stomach [ ]

84. Nightmares [ ]

85. Blurred vision [ ]

86. Sleep problems after work [ ]

87. Hard to turn head [ ]

88. Feel weaker [ ]

89. Hand/finger numbness [ ]

90. Feel tingling down hands [ ]

91. Forearm tightness [ ]

Workstyle Subscale Scoring Procedures

1. Individual questions should be scored according to response. The Likert-scale response scores range from zero to four where:
"Almost Never" = 0
"Rarely" = 1
"Sometimes" = 2
"Frequently" = 3
"Almost Always" = 4

The dichotomous (check vs. no check) response items should be scored such that items selected by the respondent receive a score of one and items not selected (left blank) receive a score of zero.

2. Each subscale is scored by adding the scores of all the questions in that subscale where:

Working Through Pain = sum of scores for questions 1-13
Social Reactivity = sum of scores for questions 14-25
Limited Workplace Support = sum of scores for questions 26-35
Deadlines/Pressure = sum of scores for questions 36-45
Self-imposed Workpace/Workload = sum of scores for questions 46-55
Breaks = sum of scores for questions 56-57
Mood = sum of scores for questions 58-71
Pain/Tension = sum of scores for questions 72-78
Autonomic = sum of scores for questions 79-86
Numbness/Tingling = sum of scores for questions 87-91

3. Workstyle Characteristic Responses to the Workplace Score: This subscale is a measure of the cognitive/behavioral responses of workstyle to the workplace in general. To score this subscale, add the scores of the Working Though Pain, Social Reactivity, Limited Workplace Support, Deadlines/Pressure, and Self-imposed Workpace/Workload subscales . Then subtract the score for the Breaks subscale.

Characteristic Responses to the Workplace Score = Working Though Pain + Social Reactivity + Limited Workplace Support +
Deadlines/Pressure + Self-imposed Workpace/Workload - Breaks

2. Workstyle Reactivity to High Work Demands Score: This subscale is a summation of the dichotomous items factors. The Reactivity to High Work Demands Score is subdivided into two subscales: Distress (emotional and physiological) and Symptoms response to high work demands/high workload.

- Distress: This subscale is a summation of all dichotomous items designed and believed to be representative of distress related to workstyle. Items include Mood and Autonomic subscales. See syntax below.

Distress = Mood + Autonomic

- Symptoms response to high work demands/high workload: This subscale is a summation of physical symptoms subscales Pain/Tension and Numbness/Tingling, which are believed to be representative of symptoms resulting from work demands. See syntax below.

Symptoms Response = Pain/Tension + Numbness/Tingling

3. Total Workstyle Score: This subscore is a summation of Characteristic Responses to the Workplace Score and Distress Score. It was calculated for differentiating groups based on workstyle scores, while not including their immediate symptoms during work demands. This score is used for most comparisons and predictions of groups because it is unbiased by the individual's presenting levels of symptomotology and/or disability. See syntax below.

Total Workstyle Score = Characteristic Responses to the Workplace Score + Distress Score.

REFERENCES

Ahlberg-Hulten, G.K., Theorell, T., & Sigala, F. (1995). Social support, job strain and musculoskeletal pain among female health care personnel. Scandinavian Journal of Work Environment and Health, 21, 435-439.

Armstrong, T.J., Buckle, P., Fine, L., Hagberg, M., Jonsson, B., Kilbom, A., Kuorinka, I.A., Silverstein, B.A., Sjogaard, G., & Viikari-Juntura, E.R. (1993). A conceptual model of work-related neck and upper limb musculoskeletal disorders. Scandinavian Journal of Work, Environment, and Health, 19, 73-84.

Armstrong, T.J., Foulke, J.A., Martin, B.J., Gerson, J., & Rempel, D.M. (1994). Investigation of applied forces in alphanumeric keyboard work. American Industrial Hygiene Association Journal, 55, 30-35.

Bernacki, E.J., Guidera, J.A., Schaefer, J.A., Lavin, R.A., & Tsai, S.P. (1999). An ergonomics program designed to reduce the incidence of upper extremity work related musculoskeletal disorders. Journal of Occupational and Environmental Medicine, 41(12), 1032-1041.

Bongers, P.M., de Winter, C.R., Kompier, M.A.J., & Hildebrandt, V.H. (1993). Psychosocial factors at work and musculoskeletal disease. Scandinavian Journal of Work, Environment, and Health, 19, 297-312.

Bongers, P.M., Kremer, A.M., & ter Laak, J. (2002). Are psychosocial factors risk factors for symptoms and signs of the shoulder, elbow, or hand/wrist? A review of the epidemiological literature. American Journal of Industrial Medicine, 41, 315-342.

Borg, G. (1990). Psychophysiological scaling with applications in physical work and the perception of exertion. Scandinavian Journal of Work Environment Health, Suppl 16, 55-58.

Bureau of Labor Statistics, US Department of Labor (2001). Survey of occupational injuries and illnesses. (Report No. USDL 01-71). Available Internet: http://www.bls.gov/case/osch0021.pdf

Burgess-Limerick, R., Shemmell, J., Scadden, R., & Plooy, A. (1999). Wrist posture during computer pointing device use. Clinical Biomechanics, 14, 280-286.

Cahill, J. (1996). Psychosocial aspects of interventions in occupational safety and health. American Journal of Industrial Medicine, 29, 308-313.

Carayon, P., Smith, M.J., & Haims, M.C. (1999). Work organization, job stress, and work-related musculoskeletal disorders. Human Factors, 41(4), 644-663.

Christmansson, M., Friden, J., & Sollerman, C. (1999). Task design, psycho-social work climate and upper extremity pain disorders – effects of an organizational redesign on manual repetitive assembly jobs. Applied Ergonomics, 30, 463-472.

Dane, D., Feuerstein, M., Huang, G.D., Dimberg, L., Ali, D., & Lincoln, A. (2002). Measurement properties of a self-report index of ergonomic exposures for use in an office work environment. Journal of Occupational and Environmental Medicine, 44(1), 73-81.

Elkin, A.J. & Rosch, P.J. (1990). Promoting mental health at the workplace: The prevention side of stress management. Occupational Medicine: State of the Art Reviews, 5(4), 739-754.

Elo, A.L, & Leppanen, A. (1999). Efforts of health promotion teams to improve the psychosocial work environment. Journal of Occupational Health Psychology, 4(2), 87-94.

Ferguson, K.L. & Rodway, M.R. (1994). Cognitive behavioral treatment of perfectionism: Initial evaluations studies. Research on Social Work Practice, 4(3), 283-308.

Feuerstein, M. (1996). Workstyle: Definition, empirical support, and implications for prevention, evaluation, and rehabilitation of occupational upper-extremity disorders. In S.D. Moon & S.L. Sauter (Eds.), Beyond biomechanics: Psychosocial aspects of musculoskeletal disorders in office work. Bristol, PA: Taylor and Francis Ltd.

Feuerstein, M., Armstrong, T., Hickey, P. & Lincoln, A. (1997)a. Computer keyboard force and upper extremity symptoms. Journal of Occupational and Environmental Medicine, 39, 1144-1153.

Feuerstein, M., Carosella, A.M., Burrell, L.M., Marshall, L., & DeCaro, J. (1997)b. Occupational upper extremity symptoms in sign language interpreters: Prevalence, and correlates of pain, function, and work disability. Journal of Occupational Rehabilitation, 7, 187-205.

Feuerstein, M. & Fitzgerald, T.E. (1992). Biomechanical factors affecting upper extremity cumulative trauma disorders in sign language interpreters. Journal of Occupational Medicine, 34, 257-264.

Feuerstein, M., Huang, G.D., Haufler, A.J., & Miller, J.K. (2000). Development of a screen for predicting clinical outcomes in patients with work-related upper extremity disorders. Journal of Occupational and Environmental Medicine, 40, 546-555.

Feuerstein, M., Huang, G.D., & Pransky, G. (1999). Workstyle and work-related upper extremity disorders. In R.J. Gatchel & D.C. Turk (Eds.), Psychosocial factors in pain. New York: Guilford.

Firth-Cozens, J. (2000). New stressors, new remedies. Occupational Medicine, 50(3), 199-201.

Frederiksson, K., Alfredsson, L., Koster, M., Bildt Thorbjornsson, C., Toomingas, A., Torgen, M., & Kilbom, A. (1999). Risk factors for neck and upper limb disorders: results from 24 years of follow up. Occupational and Environmental Medicine, 56(1), 59-66.

Fry, H.J.H. (1989). Overuse syndromes in instrumental musicians. Seminars in Neurology, 9(2), 136-145.

Guadagnoli, E. & Velicer, W.F. (1988). Relation of sample size to the stability of component patterns. Psychological Bulletin, 103(2), 265-275.

Hakkanen, M., Viikari-Juntura, E., & Takala, E.P. (1997). Effects of changes in work methods on musculoskeletal load. An intervention study in the trailer assembly. Applied Ergonomics, 28(2), 99-108.

Hales, T.R., Sauter, S.L., Peterson, M.R., Fine, L.J., Putz-Anderson, V., Schliefer, L.R., Ochs, T.T., & Bernard, B.P. (1994). Musculoskeletal disorders among visual display terminal users in a telecommunications company. Ergonomics, 37, 1603-1621.

Haufler, A.J., Feuerstein, M., & Huang, G.D. (2000). Job stress, upper extremity pain and functional limitations in symptomatic computer users. American Journal of Industrial Medicine, 38, 507-515.

Herbert, R., Gerr, F., & Dropkin, J. (2000). Clinical evaluation and management of work-related carpal tunnel syndrome. American Journal of Industrial Medicine, 37, 62-74.

Heron, R.J.L., McKeown, S. Tomenson, J.A. & Teasdale, E.L. (1999). Study to evaluate the effectiveness of stress management workshops on response to general and occupational measures of stress. Occupational Medicine, 49(7), 451-457.

Himmelstein, J.S., Feuerstein, M., Stanek, E.J., Koyamatsu, K., Pransky, G.S., Morgan, W., & Anderson, K.O. (1995). Work-related upper-extremity disorders and work disability: Clinical and psychosocial presentation. Journal of Occupational and Environmental Medicine, 37(11), 1278-1286.

Hosmer, D.W., & Lemeshow, S. (2000). Applied Logistic Regression 2nd ed. New York, NY: Wiley Interscience.

Huang, G. D., Feuerstein, M., & Sauter, S. L. (2002). Occupational stress and work-related upper extremity disorders: Concepts and models. American Journal of Industrial Medicine, 41, 298-314.

Hurrell, J.J. & Murphy, L.R. (1996). Occupational stress intervention. American Journal of Industrial Medicine, 29, 338-341.

Hurrell, J.J., Nelson, D.L., & Simmons, B.L. (1998). Measuring job stressors and strains: Where we have been, where we are, and where we need to go. Journal of Occupational Health Psychology, 3, 368-389.

Huskisson, E.C. (1974). Measurement of pain. Lancet, Nov. 9, 1127-1131.

Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. Journal of Occupational Health Psychology, 3, 322-355.

Karlqvist, L.K., Hagberg, M., Koster, M., Wenemark, M., & Anell, R. (1996). Musculoskeletal symptoms among computer-assisted design (CAD) operators and evaluation of a self-assessment questionnaire. International Journal of Occupational and Environmental Health, 2, 185-194.

Kompier, M.A.J., Aust, B., van den Berg, A.M., & Siegrist, J. (2000). Stress prevention in bus drivers: Evaluation of 13 natural experiments. Journal of Occupational Health Psychology, 5(1), 11-31.

Landsbergis, P. & Theorell, T. (2000). Measurement of psychosocial workplace exposure variables. Occupational Medicine: State of the Art Reviews, 15(1), 163-188.

Lundberg, U., Dohns, I.E., Melin, B., Sandsjo, L., Palmerud, G., Kadefors, R., Ekstrom, M., & Parr, D. (1999). Pyschophysiological stress responses, muscle tension, and neck and shoulder pain among supermarket cashiers. Journal of Occupational Health Psychology, 4(3), 245-255.

Mackinnon, S.E. & Novak, C.B. (1994). Clinical commentary: Pathogenesis of cumulative trauma disorder. Journal of Hand Surgery, 19A(5), 873-883.

Macklowitz, M.M. (1980). Workaholics: Living with them, working with them. Cited by McMillan, L.H.W., O'Driscoll, M.P., Marsh, N.V., & Brady, E.C. (2001). Understanding workaholism: Data synthesis, theoretical critique, and future design strategies. International Journal of Stress Management, 8(2), 69-90.

Marcotte, A., Barker, R., Joyce M., Miller, N. Klinenberg, E.J., Cogburn, C.D., & Goddard, D.E. (1997). Preventing work-related musculoskeletal illnesses through ergonomics: The Air Force PREMIER Program, volume 2: Job Requirements and

Physical Demands Survey methodology guide. Brooks Air Force Base, TX: Occupational and Environmental Health Directorate.

Marlowe, D., & Crowne, D.P. (1960). A new scale of social desirability independent of psychopathology. Journal of Consulting Psychology, 24, 349-354.

McMillan, L.H.W., O'Driscoll, M.P., Marsh, N.V., & Brady, E.C. (2001). Understanding workaholism: Data synthesis, theoretical critique, and future design strategies. International Journal of Stress Management, 8(2), 69-90.

Melhorn, J.M., Wilkinson, L., & Riggs, J.D. (2001). Management of musculoskeletal pain in the workplace. Journal of Occupational and Environmental Medicine, 43(2), 83-93.

Melin, B. & Lundberg, U. (1997). A biopsychosocial approach to work-stress and musculoskeletal disorder. Journal of Psychophysiology, 11, 238-247.

Moos R.H., & Moos, B.H. (1994). Life stressors and social resources inventory adult form manual. Odessa, FL: Psychological Assessment Resources.

Murphy, L.R. (1996). Stress management in work settings: A critical review of health effects. American Journal of Health Promotion, 11(2), 112-135.

National Research Council and the Institute of Medicine (2001). Musculoskeletal disorders and the workplace: Low back and upper extremities. Panel on Musculoskeletal Disorders and the Workplace. Commission on Behavioral and Social Sciences and Education. Washington DC: National Academy Press.

National Institute of Occupational Safety and Health (NIOSH) (1992). Health Hazard Evaluation 89-299-2230: U.S. West Communications, Phoenix, AZ, Minneapolis, MN, Denver, CO. [HHE 89-299-2230. NTIS Report No. PB 92-119-311]. Cincinnati, OH: US Department of Health and Human Services, Public Health Service, Centers for Disease Control.

National Institute of Occupational Safety and Health (NIOSH) (1997). Carpal tunnel syndrome. (Document No. 705001). Available Internet: http://www.cdc.gov/niosh/ctsfs.html.

Nord, S., Ettare, D., & Hodge, S. (2001). Muscle learning therapy – efficacy of a biofeedback based protocol in treating work-related upper extremity disorders. Journal of Occupational Rehabilitation, 11(1), 23-31.

Nunnally, J.C. & Bernstein, I.H. (1994). Psychometric Theory, 3rd ed. New York, NY: McGraw-Hill Inc.

Parlitz, D., Peschel, T., & Altenmuller, E. (1998). Assessment of dynamic finger forces in pianists: Effects of training and expertise. Journal of Biomechanics, 31, 1063-1067.

Pascarelli, E.F. & Kella, J.J. (1993). Soft tissue injuries related to use of the computer keyboard. Journal of Occupational Medicine, 35(5), 522-532.

Piligian, G., Herbert, R., Hearns, M., Dropkin, J. Landsbergis, P., & Cherniack, M. (2000). Evaluation and management of work-related musculoskeletal disorders of the distal upper extremity. American Journal of Industrial Medicine, 37, 75-93.

Porter, G. (2001). Workaholic tendencies and the high potential for stress among coworkers. International Journal of Stress Management, 8(2), 147-164.

Pransky, G., Feuerstein, M., Himmelstein, J., Katz, J.N., & Vickers-Lahti, M. (1997). Measuring functional outcomes in work-related upper extremity disorders. Journal of Occupational and Environmental Medicine. 39, 1195-1202.

Remple, D., Dahlin, L., & Lundborg, G. (1999). Pathophysiology of nerve compression syndromes: Response of peripheral nerves to loading. Journal of Bone and Joint Surgery, 81A(11), 1600-1610.

Reynolds, S. (2000). Interventions: What works, what doesn't? Occupational Medicine, 50(5), 315-319.

Sauter, S.L. & Swanson, N.G. (1996). An ecological model of musculoskeletal disorders in office work. In S.D. Moon & S.L. Sauter (Eds.), Beyond biomechanics: Psychosocial aspects of musculoskeletal disorders in office work. Bristol, PA: Taylor and Francis Ltd.

Schaufeli, W.B. & Peeters, M.C.W. (2000). Job stress and burnout among correctional officers: A literature review. International Journal of Stress Management, 7(1), 19-48.

Schierhout, G.H. & Myers, J.E. (1996). Is self-reported pain an appropriate outcome measure in ergonomic-epidemiologic studies of work-related musculoskeletal disorders? American Journal of Industrial Medicine, 30(1), 93-98.

Scott, K.S., Moore, K.S., & Miceli, M.P. (1997). An exploration of the meaning and consequences of workaholism. Human Relations, 50, 287-314.

Smith, M.J., & Carayon-Sainfort, P. (1989). A balance theory of job design for stress reduction. International Journal of Industrial Ergonomics, 4, 67-79.

Smith, M.J., & Carayon P. (1996). Work organization stress and cumulative trauma disorders. In S.D. Moon & S.L. Sauter (Eds.), Beyond biomechanics:

Psychosocial aspects of musculoskeletal disorders in office work. Bristol, PA: Taylor and Francis Ltd.

Streiner, D.L., & Norman, G.R. (1995). Health measurement scales: A practical guide to their development and use. 2nd ed. New York, NY: Oxford University Press Inc.

van der Klink, J.J.L., Blonk, R.W.B., Schene, A.H., & van Dijk, F.J.H. (2001). The benefits of interventions for work-related stress. American Journal of Public Health, 91(2), 270-276.

Ware, J., Kosinski, M., Keller, S. (1998). SF-12: How to score the SF-12 physical and mental health summary scales. 3rd ed. Lincoln, RI: Quality Metric Inc.